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Straw and Tagal Bleaching and Dyeing

Part 1*—Historic and Economic.

By **FRED. GROVE-PALMER, A.I.C.**

THE straw hat industry is a very old one; it is one of the old-time home crafts, and in one form or another is to be found flourishing in practically every civilized and partly-civilized country.

It is probable that the art of straw plaiting was brought to our shores by the Pilgrim Fathers, as it is just the kind of occupation that would have made a strong appeal to the naturally industrious instincts of their energetic womenfolk. Straw plaiting had been introduced into Scotland only seventy years before by Mary, Queen of Scots, who brought with her some skilled workers from Lorraine. Her son, on his accession to the English throne as James I, was instrumental in establishing the trade in two villages, Dunstable and Hemel Hempstead, centers of fine agricultural country, where straw grew plentifully. The plaiting industry remained around that part of England and brought some of the towns into world-wide prominence by reason of the excellence of the productions. But long enough before Italy was famed for her straw plaits and even to-day women in all parts of the world speak of Tuscan straw with the deepest respect.

The Italians used wheat, just as the English did, but it was much finer; the method of growing it is to sow the grain very plentifully on exceedingly poor ground which results in the production of thin stalks. Special kinds of wheat are used; the best is the celebrated Pontederas Semone, followed in popular esteem by Mazzuolo and Santa Fioro. It is this latter which is largely used for plaiting Tuscan Pedals, a work which is so trying for the eyes that the women and children who are employed on it can only work for two or three hours daily. This refers, of course, to hand plaiting which has now, for all practical purposes, been replaced by machines.

The straw is pulled up by the roots just before the ears have had time to ripen. This method of collecting differs from the old English plan whereby the straw was carefully cut with a sickle. For this purpose the two breeds of wheat that were most favored were Chiddam and Old Red Lammas.

Of the different kinds of braid and the fibers used in their manufacture there is practically no limit; every year sees the arrival on the markets of the world of a new form of "straw" headgear suited for one or other purpose. The modern tendency, it must be confessed, has been towards cheapness with a consequent deterioration in quality, but the more recent trend of fashion, as dictated by the Parisian milliners, has been towards light weight straw plaits made up into hats of a much larger size than has been worn of late years. Hence the freshly aroused interest in the bleaching and dyeing of the many fibers that are used in their production.

The increased popularity of many kinds of straw plait has been due to the cheapening of manufacture arising from two chief causes; the one was the introduction of machinery to replace the old, beautiful but slow, handicraft, and the other was the awakening of the peoples of the Far East to the possibilities of cheap labor and its effect upon their respective export trades. Like all commodities that are subject to the vagaries of fashion, the straw plaiting trade is uncertain; there is an ever-present risk that any stock of braid may be absolutely out of the running by the time it reaches the American or European markets. But as the fashions of one country do not always change at the same time as those of another, there is always just the chance for a rapid transference of stock from one place to the other in time to catch the trade before the change occurs. When, as often happens, a certain make of braid reaches a market that has no use for it and price falls to an absurdly low figure, it may re-awaken the desire for that particular pattern and the stock can be disposed of, the price immediately rising

**Part II Dyeing and Bleaching will appear in the next issue.*

with the increased demand. As a Berlin straw hat importer once told the writer, it is perhaps the most chancy and uncertain of all trades.

We speak of "straws" and straw hats in a loose sort of way including in the expressions many fibers that are not straws and some that are not even vegetable or natural fibers at all; still is a convenient term and may as well be used. In the following list, by no means complete, will be found some of the more noteworthy of the different sorts of plaits that reach the markets of the world:

Plaits composed of wheat straw braids sewn with overlapping edges.

Leghorns in which the braids are sewn together with the edges touching but not overlapping.

Hoods in which the fibers are woven like baskets in a criss-cross or a wattle pattern.

Grass hats, such as those of Panama and the surrounding countries, which have been exported for over three centuries on account of the fineness of their weaves.

Imitation Panamas made largely of such Japanese grasses as kuroharii.

Bankoks from Siam, Javas, silky looking Yeddas and Bowens from Sumatra, Manillas, and Brazilians.

Chinese rush hoods.

The low luster Raffias from the West Indian Islands.

All kinds of hemp braids in various styles from Switzerland, Italy, China and Japan.

Crinolines, which were originally woven of horsehair and later had admixtures of other fibers; then they were made of cotton and subsequently artificial straw was brought in. Viscose and cellulose acetate yarns are also employed for the purpose.

Sparterie, a fine chip of wattle-woven willow, which is largely employed for foundations.

Willow chip braids from Italy and Japan, and its successor Satin Chip in which rayon is mingled with the wood.

Tagal of the finer grades of hemp, bleached. This has been followed by tagal picot or pedal tagal derived from Italy, Switzerland and Japan.

Although plaiting machinery had been in use for a long time in the European straw centers, there was no diminution of the hand production of Lutons and Dunstables until somewhere around 1870. The earlier forms of straw plaits were made with the whole stalks; as a consequence there was quite a considerable variation in the widths of the braids from time to time, but when some bright lad had a brain wave and took to splitting straws, putting two slips together with the siliceous faces outwards it was possible, not only to make the braids of standard sizes but also to get them in widths up to 70s and 80s. The skill of the workers in these towns was so great that there was a world-wide demand for the productions which soon outstripped the homegrown supplies of straw. This led to the importation of supplies from other countries, and it was not long before the inhabitants of those places realized that if one race could make braids there was nothing to prevent another following the same lines. So keenly did they devote themselves to the industry that it was not a great while before the English straw-plaiting trade was killed stone dead, with the result that braids manufactured in foreign countries are now looked upon as a raw material by the Luton hat makers.

The Italians for a long time held the monopoly of willow chip braids, all of which were made by hand, and were renowned for their high luster. The industry was started in Saxony and other parts of Germany, notably in the Black Forest, where a certain measure of success was attained, though the luster was less and the plaits had a wooliness that put them in a lower grade. In 1890, the Japanese took to making this form of braid by machinery and after the usual vicissitudes have now worked themselves up to a stage where they are causing the Italians no little trouble by the excellence of the quality and by the enormous quantity they are producing.

Crinolines have a perennial interest: they are always fashionable somewhere because of their good wearing qualities, quite apart from their beauty. In the early form, when only horsehair was used for making them, the order of the plaiting was represented by the formula:

$$\frac{X}{4} + 1$$

The finest quality of braid that was made had 17 strands of hair and measured ⅛ in. in width; the more usual braids for hats are those with 21 or 25 strands. In the 1870s when women of fashion were wearing bonnets, these were often made of Crinoline Fancy, a lighter fabrication containing wheat straw, Tuscans and some silk mixed in with the hair. About that period, began the introduction of cotton in a small way, though the resulting braid had little of the fine qualities of the original. It met with small success for about twenty years when the persistence of the German plaiters resulted in the production of an improved form, called "ajour," which was so closely like the real crinoline that it captured practically the whole of the trade. Little, if any, horsehair is now used in the braids passing as crinolines, which contain much artificial straw and rayon, and are of great beauty and delicacy.

The Italians, having used willow chip from the start, still hold the market for making Sparterie, the wattle-woven sheets of very fine chip that is used as the base for making hats of such delicate braids that will not withstand the wet-stiffening processes. This material can be stiffened to the consistency of buckram, if needed, and is now being made in such quantity by the Japanese that the Italian monopoly is threatened.

Tagals really form a class of their own, but as they are made from vegetable fibers there is no real reason why they should not be included here. The first mention of them in the hat trade appears in 1892, where they were exported from Switzerland and at once took a prominent place in all centers of fashion, and even this year, though some manufacturers are deploring their disap-

pearance from the millinery shows, there is a very big trade being done in them. The Italians, ever on the watch for novelties, soon saw the great possibilities of tagal and went in for it strongly, and in the normal sequence of events in the plaiting industry, the Japanese have now the bulk of the business.

There is some doubt as to the spelling and origin of the word "tagal"; the meaning mostly favored is that the fiber, being derived from the Japanese port, Tegal, recently brought into public notice by the landing there of the "Lone Dove" in her flight to Australia, gave its name to the plaits. This is by no means certain, however, as the French word "tige," meaning a stem, has the derivatives "tigelle" and "tigel", both meaning a very fine stalk. It is very probable that the delicacy of the plaits suggested this name to the manufacturers. The English speaking users would have found nothing strange or unfamiliar in the word which closely resembles "teagle", an Early English word for a thin stranded bird snare; another application of the same word is similar to "tackle" for hoisting weights, a possible allusion to the great strength of the braids. Folk of Scottish descent will also recall such good old words as "tagle", "tagil", "tagyl", "taigle" and "teagle" which all mean much the same as "tangle" and have a possible reference to the complication of the plaiting, while the Italian: "taglia", an arrangement of pulleys, may have a bearing upon the machine used for making the braids. It will be seen, therefore, that there are many possible derivations of the expression tagal, tegal, tagel or teagle. The spelling adopted on the scientific side is the first of these but the hat makers still appear to use any or all of them indiscriminately.

As now made, it is composed of the finest quality of Manila hemp which is exported from the Philippines to Japan, there to be plaited and sent to the American market in large consignments. The European market is also supplied from the same source and some fiber of the Bowstring Hemp, Sansaviera zeylanica, a species of aloe growing in Java, is sent to Italy for the same purpose.

The original tagal that came out of Switzerland, though machine made, strongly resembled the old hand plaited seven or nine end chips, though tougher and with a better luster. It is made by first plaiting the fibers into strands containing two or three ends, though some singles are used for the finest grades. The strands are then plaited into braids which may be described as:

13/2 = 13 strands each containing 2 fibers, or
13/3 = 13 strands each containing 3 fibers, etc.

The first users were wont to speak of these as shoe-string braids, but they were replaced, not long afterwards by the Italian form made like a seven-end pedal; this was the tagal-pedal, or as it was called by the Parisians, tegal-picot. Naturally, the Japanese were not long in getting on the track of this development and though their initial efforts were practically useless, they very soon mastered the technique of the manufacture and now produce about 95 per cent of the world's supply. The higher class trade, both in America and in Europe, still prefers to use the tagals of Switzerland and Italy because of its squareness and extra firmness, in which qualities they surpass the Japanese output. Extreme durability and toughness are the principal characteristics of tagal, and to them it owes its continued popularity, being the strongest of fibers used in the hat trade. The fibers for tagal are bleached to a pale flax color, not to a paper-white, for the Japanese market.

V. Patty, in "Hats and How to Make Them", published in New York in 1925, describes twenty different kinds of plaits and braids commonly met with in the trade; included among these are: chenille, zipper, milan, china, hizéré, baby azure, a number of artificial fibers, and tagal.

Before turning to a consideration of the chemical treatment of straws, in the widest sense, to fit them for use in the hat trade, it may be of interest to glance momentarily at some aspects of the trade itself in other

Tagal Hemp Braid Machine

parts of the world. In Argentina, for example, the use of straw hats called for between two and three per head of the population; in the main, these hats are of domestic manufacture, the braids being imported from Japan, England, France and the United States, in that order of magnitude of business. Owing to the fact that the principal buyers in Buenos Aires have price fixed in their minds as the prime consideration, the Japanese win, but it must also be admitted that their bleaching is really fine, and moreover, because they rewind into tighter hanks, their shipments take up less room, thus effecting a saving on the freight charges. The Argentine braid business looks like becoming a Japanese monopoly unless the other importers take care. At the same time, the supply of sweatbands, which was until recently practically all in the hand of English manufacturers, is now seriously threatened by the imports from the United States.

The Swiss plaiting industry is well over two centuries old; Wohlen was the earliest center of the trade and there was a community of braid makers numbering several hundreds as far back as 1740. The Swiss, for a hundred years or more, used only rye straw, but as their knowledge increased they brought in silk, cotton, fiber flax, hemp, horsehair and finally rayon. About 95 per cent of the hats used are made in the country, and many are exported to Germany, France and Italy. Ninety per cent of the

imported braids are from Japan and China, the remainder coming from the Dutch East Indies.

In China, the modern hat industry was started in Chifoo in 1860, but the plaiting of rushes and grasses for headgear dates back from time immemorial. Shanghai and Chili are the present centers of the hat trade, they being wheat growing districts. The shape of hat mostly favored by the Chinese is of the American pattern, round with a dished crown, made of soft, pliable straw and produced at very low prices, such that foreign competition stands no chance of touching. The straw for the best grades is grown in Shantung, the plaiting being a home industry in which, during the winter the whole family takes its part. The braids are brought to market in the spring when the finest qualities are sorted out for export. For home consumption, the coarse braids run 240 yards to the hank, the fine has 60 yards. A bundle contains 240 hanks, and a box consists of 480 bundles. The acme of Chinese braid, that called Golden Silk, is made from imported straw. A large number of imitation Panamas are manufactured, some for export. The former trade with Japan has now died out, as the Chinese can now make all they require.

The Japanese hat trade reaches colossal figures; there are thousands of factories, and their annual output reaches somewhere around three million dozens.

The hat industry is not the only one in which straws are used, though it is, admittedly, the principal. Baskets and mattings form a large outlet for fibers of many kinds while in countries enjoying much sunshine, there is much business in the making of blinds and shades. In many instances these are dyed by the natives of the lands in which they are made, using natural dyestuffs. The manufacture of Tinnevelly grass mats is a valuable village industry in parts of India where grasses belonging to the genus Cyperus are grown for the purpose. C. corymbosus has the finest stalks, which when split into a dozen or more slips are made up into the best grade mats. A very much coarser kind of matting is made from the unsplit culms of C. tegetum. This form of mat is made on hand looms, having a stout cotton yarn for the warp. Formerly, none but natural dyes were used for coloring the grass and for the simple printing designs, but of late years many imported aniline colors have been brought into the country especially suited for this purpose.

The doum palm, Hyphaene thebaica, is used in both the Sudan and Nigeria for mat making, being dyed with natural colors in orange, saxe blue, mauve and black, with a good red in the latter country. The baskets of Sierra Leone are world famous for the excellence of the native workmanship; both dried grasses and split palm leaves are utilized which are bleached to a milky whiteness. They use several shades of yellow, red, indigo and black, all natural colors.

(*To be continued*)

The United States Tariff Commission*

By **Dr. EDGAR B. BROSSARD**
Chairman, United States Tariff Commission

THE United States Tariff Commission is under the spotlight at present. The Congress is still struggling with the tariff problem. They have recently been discussing in conference and on the floor of the Senate the make-up and powers of the Commission. The Conference Committee proposed to extend its authority. Changes that have been suggested in the new tariff bill show the necessity for such a scientific fact-finding body to supply accurate information with respect to the many phases of the intricate tariff problems. I shall discuss briefly the history, personnel and duties of the Commission.

History

The necessity for a permanent government agency, such as the Tariff Commission, to collect accurate information about the tariff and the operation of our customs laws and to recommend to Congress desirable changes in such laws, has long been recognized. One of the great classics of American economics is the Report on Manufactures made by the first Secretary of the Treasury, the great Alexander Hamilton. That great document during the 140 years since it was written has had a tremendous influence upon the tariff policy of this country. That information has been useful to more than one Congress. From that time the desire for facts and more facts about the thousands of details involved in tariff legislation has continued to grow.

Sixty-five years ago the Congress authorized a revenue commissioner to make investigations and to suggest to Congress desirable changes in the revenue laws, and he did so.

During the next half-century strong sentiment in favor of the creation of a permanent body for the furnishing of information about the tariff began to take definite form throughout the country. For a time a number of different government agencies gathered tariff information for the President and the Congress. Presi-

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dent Theodore Roosevelt was in favor of establishing a scientific body for gathering factual information about the tariff. Finally, in September, 1909, President William Howard Taft, under authorization provided in the Payne-Aldrich Tariff Act, appointed five members to the Tariff Board, often referred to as the "Taft Tariff Board." This board functioned until 1912, when Congress failed to make further appropriations for it and it was dissolved.

By 1916 public sentiment had crystallized in favor of a permanent scientific fact-finding body and the creation of the United States Tariff Commission was authorized by Title 7 of the Revenue Act of September 8, 1916. The Commission has functioned under that law for the past 14 years.

Personnel

The personnel of the Tariff Board, organized under the Payne-Aldrich bill and appointed by President Taft, consisted of five members, three Republicans and two Democrats—Henry C. Emery, of Connecticut, chairman; Alvin H. Sanders, of Illinois; James B. Reynolds, of Massachusetts, Republicans; and William M. Howard, of Georgia, and Dr. Thomas Walker Page, of Virginia, Democrats.

President Woodrow Wilson appointed the first six members of the United States Tariff Commission—Dr. Frank W. Taussig, of Massachusetts, chairman; Daniel C. Roper, of South Carolina, vice chairman, and David J. Lewis, of Maryland, Democrats; and William Kent, of California; William S. Culbertson, of Kansas, and Edward Costigan, of Colorado, Republicans. The Commission was formally organized as of April 1, 1917.

Congress clearly intended, in making the membership bi-partisan, that the views of both major political parties should be represented on the Commission. The three Republicans now on the Commission are Dr. Edgar B. Brossard, of Utah, chairman; Thomas C. Marvin, of Massachusetts, and Sherman J. Lowell, of New York; and the three Democrats are Dr. Alfred P. Dennis, of Maryland, vice chairman; Lincoln Dixon, of Indiana, and Frank Clark of Florida.

Others who have served as members of the Commission, together with the period of their services, are: Dr. Thomas Walker Page, of Virginia, Democrat, from February 19, 1918, to February 28, 1923; William Burgess, of New Jersey, Republican, from June 27, 1921, to June 1, 1925; Henry H. Glassie, of the District of Columbia, Democrat, from March 1, 1923, to March 4, 1927, and A. H. Baldwin, of New York, Republican, from June 22, 1925, to July 3, 1926.

The pending tariff bill provides for the continuation of the Tariff Commission. The bill as it passed the House of Representatives provided for the reorganization of the Commission with seven members for terms of seven years, to be appointed by the President without consideration of the political party to which appointees belonged. The Senate bill provided for the continuation of the bi-partisan commission of six members with terms of six years, instead of 12 years, as at present. The conferees accepted the Senate proposal. Under the new tariff bill, if passed as now written, the Commission will continue to be composed of six members, three Republicans and three Democrats, to be appointed by the President with the advice and consent of the Senate.

The President is required under the new bill as reported by the conferees to reorganize the Commission within ninety days from the date he signs the bill. He may appoint six new commissioners or reappoint any of the present members that he may desire to have on the Commission.

The Commission is an important body. If its powers are properly exercised it may do a great public service. Members of the Commission have opportunity, by furnishing factual information, to assist the President, the Congress and the general public, both in the United States and abroad, to a more thorough understanding of the tariff problems. The work of the Commission is vital and interesting.

Duties

Until 1909 there was no permanent governmental body expressly organized for the sole purpose of assembling tariff information for Congress during tariff revision and devoting itself at other times to research on tariff problems. The Tariff Board, at the request of President Taft, made a number of careful investigations and reports, among them were reports on the woolen and cotton industries, with respect to both the raw agricultural products and the manufactures. Much of the data in these reports is still used by Congress during tariff revision. This is especially true with respect to certain statistics necessary to calculate compensatory duties on wool and cotton textiles. The Tariff Board also assembled much information that was useful to Congress during the consideration and preparation of the Underwood-Simmons Act of 1913.

The duties of the Tariff Commission since its organization in 1917 may be divided into two parts—(1) the general duties of the Commission provided for in the Tariff Act of 1916, and (2) the special duties under the Tariff Act of 1922. Since the pending tariff bill re-enacts the provisions of the Acts of 1916 and 1922, pertaining to the general powers of the Commission and also in a modified form those having to do with the Commission's special duties and responsibilities, such as making investigations to assist the President to adjust the rates of duty, these phases of the Commission's work shall be discussed in connection with the provisions in the new tariff bill.

General Investigations.

Section 332 of Part 2 of Title III of the new bill

sets forth the duties of the Commission under its general powers in the following language:

Sec. 332. Investigations

(a) Investigations and Reports—It shall be the duty of the Commission to investigate the administration and fiscal and industrial effects of the customs laws of this country now in force or which may be hereafter enacted, the relations between the rates of duty on raw materials and finished or partly finished products, the effects of ad valorem and specific duties and of compound specific and ad valorem duties, all questions relative to the arrangement of schedules and classification of articles in the several schedules of the customs law, and, in general, to investigate the operation of customs laws, including their relation to the Federal revenues, their effect upon the industries and labor of the country, and to submit reports of its investigations as hereafter provided.

(b) Investigations of Tariff Relations. — The Commission shall have power to investigate the tariff relations between the United States and foreign countries, commercial treaties, preferential provisions, economic alliances, the effect of export bounties and preferential transportation rates, the volume of importations compared with domestic production and consumption, and conditions, causes, and effects relating to competition of foreign industrials with those of the United States, including dumping and cost of production.

(c) Investigation of Paris Economy Pact.—The Commission shall have power to investigate the Paris Economy Pact and similar organizations and arrangements in Europe.

(d) Information for President and Congress.—In order that the President and the Congress may secure information and assistance, it shall be the duty of the Commission to—

(1) Ascertain conversion costs and costs of production in the principal growing, producing, or manufacturing centers of the United States of articles of the United States, whenever in the opinion of the Commission it is practicable;

(2) Ascertain conversion costs and costs of production in the principal growing, producing, or manufacturing centers of foreign countries of articles imported into the United States, whenever in the opinion of the Commission such conversion costs or costs of production are necessary for comparison with conversion costs or costs of production in the United States and can be reasonably ascertained;

(3) Select and describe articles which are representative of the classes or kinds of articles imported into the United States and which are similar to or comparable with articles of the United States; select and describe articles of the United States similar to or comparable with such imported articles; and obtain and file samples of articles so selected; whenever the commission deems it advisable;

(4) Ascertain import costs or such representative articles so selected;

(5) Ascertain the grower's, producer's, or manufacturer's selling prices in the principal growing, producing, or manufacturing centers of the United States of the articles of the United States so selected;

(6) Ascertain all other facts which will show the differences in or which affect competition between articles of the United States and imported articles in the principal markets of the United States.

Flexible Tariff Provision.

Section 336 is the so-called flexible tariff provision. Under this section as reported from the Conference on the disagreeing votes of the two Houses, the Commission is authorized to make investigations of the costs of production in the United States and in the principal competing foreign countries for the purpose of assisting the President to adjust the rates of duty to equalize the difference in such costs of production.

Under existing law the President is authorized to find the rate necessary to equalize the difference in costs of production and may or may not agree with the findings of the Tariff Commission. As originally reported back to the Senate by the Conferees, the pending bill would have authorized the Tariff Commission to proclaim its own adjusted rate if the President failed to approve or disapprove the Commission's recommendations after sixty days. By the new language, however, the President is "authorized by proclamation to approve the rates of duty and changes in classification and in basis of value recommended in any report of the Commission under this section, if in his judgment such rates of duty and changes are shown by such investigation of the Commission to be necessary to equalize such differences in costs of production." The new provision apparently intends that the President shall either approve or disapprove the rates reported by the Tariff Commission as necessary to equalize costs, or he may do nothing about it if that course is in the public interest.

In ascertaining differences in costs of production, the new bill provides that "the commission shall take into consideration, in so far as it finds it practicable:

(1) In the case of a domestic article—(A) the cost of production as hereinafter in this section defined; (B) transportation costs and other costs incident to delivery to the principal market or markets of the United States for the article; and (C) other relevant factors that constitute an advantage or disadvantage in competition.

(2) In the case of a foreign article—(A) the cost of production as hereinafter in this section defined, or, if the Commission finds that such cost is not readily

ascertainable, the Commission may accept as evidence thereof, or as supplemental thereto, the weighted average of the invoice prices for values of the foreign article for a representative period, and/or the average wholesale selling price for a representative period, which price shall be that at which the article is freely offered for sale to all purchasers in the principal market or markets of the principal competing country or countries in the ordinary course of trade and in the usual wholesale quantities in such market or markets; (B) transportation costs and other costs incident to delivery to the principal market or markets of the United States for the article; (C) other relevant factors that constitute an advantage or disadvantage in competition, including advantages granted to the foreign producers by a government, person, partnership, corporation, or association, or a foreign country.

The new bill also defines as follows just what is meant by "costs of production":

> The term "costs of production", when applied with respect to either a domestic article or a foreign article, includes, for a period which is representative of conditions in production of the article: (A) The price or cost of materials, labor costs, and other direct charges incurred in the production of the article and in the processes or methods employed in its production; (B) the usual general expenses, including charges for depreciation or depletion which are representative of the equipment and property employed in the production of the article and charges for rent or interest which are representative of the cost of obtaining capital or instruments of production; and (C) the cost of containers and coverings of whatever nature, and other costs, charges, and expenses incident to placing the article in condition packed ready for delivery.

This definition makes clear some points that were left in doubt in the Act of 1922. However, the practice of the Commission under the Act of 1922 has been to calculate costs of production as defined in the new bill.

Some of the new features provided in the above paragraphs are calculated to expedite the work of the Commission and thus make possible the adjustment of rates in much shorter time after an investigation is undertaken than under the present law. For example, if foreign governments or producers refuse to cooperate with the Commission in its attempt to get foreign costs of production, the Commission may resort to invoice prices or values for a representative period or to wholesale selling prices of the articles in question, as evidence of their costs. These provisions will tend to shorten the period required for an investigation.

Subdivision (B) just quoted provides, however, that transportation costs and other costs incident to delivery to *the principal market or markets of the United States* shall be taken into consideration in so far as the Commission finds it practicable. Under an opinion of the Attorney General, the Commission has considered transportation costs in its reports to the President under the existing law. Inclusion of transportation of both the foreign and the domestic article to *the principal market or markets* in the United States, however, is new.

The Tariff Commission has had eight years of experience with the flexible provision, and many lessons have been learned. It has a staff of experts now trained for the necessary work. Most of the controversial questions involved in the flexible tariff provision of the Act of 1922 have now been settled by court decisions or by clarification in the new bill. The procedure of the Commission under the new flexible tariff provision should be improved. Short cuts should be found and the work expedited without jeopardizing the scientific accuracy of the Commission's investigations.

As in the present law, the new bill provides that adjustments of rates shall be limited to 50 per cent of those fixed in the bill, except that where the rate is on an ad valorem basis it may be changed to the basis of the American selling price. In no such case, however, shall the total decrease exceed 50 per cent of the rates expressly fixed by statute and no such rate shall be increased. The new rates in any case become effective thirty days after the date of the President's proclamation.

As in the present law, changes of rates are limited to articles on the dutiable list. No article may be transferred from the dutiable list to the free list or from the free list to the dutiable list, nor can the form of duty be changed.

Furthermore, no duty adjusted by the President after an investigation by the Commission can exceed a maximum rate where such maximum is fixed in the Act.

Unfair Practices in Import Trade.

Section 337 declares unfair methods of competition and unfair acts in the importation of articles into the United States, or in their sale, to be unlawful and punishable by exclusion of such articles from entry into the United States. The purpose of this section is to maintain the same standards of business practice respecting foreign trade as exist with respect to domestic trade and to prevent unfair methods of competition on the part of foreign governments and foreign producers and importers. The Tariff Commission is required to make all investigations under this provision and to report to the President.

Discrimination by Foreign Countries.

Section 338 provides penalties for discrimination by foreign countries against the commerce of the United States. The purpose of this provision is to protect the foreign trade of the United States. Any foreign country that gives the United States most-favored-nation treatment need never fear from the application of this statute. It may never be applied against any country. In most cases, it will be sufficient where unfair discrimination is practiced, to point it out and it will be corrected without the application of the penalties of increased duties or the prohibition of importations. This section of the Tariff Act is intended to keep the foreign commercial channels clear for our exports. The Tariff Commission is required to investigate and report to the President all such discriminations against the commerce of the United States.

Petroleum Investigation.

Subdivision (F) of Section 332 of Title III of the new bill is as follows:

> The Tariff Commission is hereby directed, within eight months from the passage of this Act, to ascertain the approximate average cost per barrel to the oil refineries located on the Atlantic seaboard of crude petroleum delivered to them from the oil fields of the United States during the three years preceding 1930, and the present approximate average cost per barrel of crude petroleum from Lake Maracaibo, Venezuela, delivered to the same points. Such relative costs shall be immediately certified to the Speaker of the House of Representatives and to the President of the Senate for the information of the Congress.

Domestic Value Investigation.

Section 340 of Title III provides that:

> The Commission shall ascertain, with respect to each of the ad valorem rates of duty, and each of the rates of duty regulated by the value of the article, specified in this Act, an ad valorem rate (or a rate regulated by the value of the article, as the case may be) which if applied upon the basis of domestic value would have resulted as nearly as possible in the imposition, during the period from July 1, 1927, to June 30, 1929, both dates inclusive, of amounts of duty neither greater nor less than would have been collectible at the rate specified in this Act applied upon the basis of value defined in section 402 of the Tariff Act of 1922.
>
> The Commission shall, as soon as practicable, but in no event later than January 1, 1932, submit a report to the Congress setting forth the classes of articles with respect to which the conversion of rates has been made, together with the converted rates applicable thereto.

Investigation of Methods of Valuation.

Section of 642 makes the following provisions:

> The United States Tariff Commission is hereby directed to make a study and investigation of the methods or bases of valuation of imported merchandise dealing with the subjects, first, in its broad aspect respecting the desirability and feasibility of change from the general plan of ascertaining the dutiable value of imported merchandise as the value in the country of its production to the general plan of ascertaining the dutiable value of imported merchandise as the value in the United States, the country of its distribution; and, second, in the aspect of its details, namely, the existing customs practice, the specific difficulties met with (either through limitations of the statutes or otherwise), and the indicated remedies, with respect to the several bases of valuation as enumerated and defined in the different subdivisions of section 402 of the Tariff Act of 1922, together with the supplemental definition of the application of this basis of valuation (the "American selling price" basis) to coal-tar products in paragraphs 27 and 28 of Title I of the Tariff Act of 1922.
>
> In dealing with the detailed aspect of the subject of the investigation, consideration shall be given in particular to the theoretical advantages and disadvantages, and probable results in practice, of that proposed method of ascertaining dutiable value which is defined in section 340 of this Act, together with like information with respect to any other method or methods for finding dutiable value, including any method of valuation with respect to which the definition of the Tariff Act of 1922 is changed in this Act.
>
> The commission shall submit to the Congress, at the earliest practicable date consistent with reasonable thoroughness, a report upon the results of this study and investigation, together with such recommendations for legislation as the Commission deems advisable, including such formulae as the Commission may propose for adjusting the rates of duty imposed by this Act to conform to any change in the basis or bases of valuation it may recommend. There are hereby authorized to be appropriated such sums as may be necessary to carry out the provisions of this subdivision of this section.

SUMMARY

It is apparent from the history of the Tariff Commission and the recital of its duties that it has important work to perform. You gentlemen of the great chemical industries of America are in a position to help in the accomplishment of those tasks. The Commission appreciates your cooperation in the past and hopes that you may be willing to continue to help the Commission to gather facts about the varied phases of your production.

General Dyestuff Releases

The General Dyestuff Corporation has recently distributed to the trade circulars announcing a new vat dyestuff, Indanthren Printing Pink FFB Paste, which, it is stated, is a homogeneous color that prints a bright pink slightly bluer than Ind. Brilliant Pink B, but of a very much better fastness to light.

The same company has likewise sent out circulars describing Indanthren Brilliant Green 2GA and 4GA, products manufactured by the General Aniline Works. These new vat colors are recommended to cotton printers for the production of particularly bright shades of excellent fastness to soaping and to chemicking, and good fastness to light.

New Nopco Building at Harrison

Work has already begun on the erection of a new four-story building of the National Oil Products Company at Harrison, N. J. The edifice, which will be ready for occupancy sometime in October, provides 25,000 sq. ft. of additional floor space. Two of the floors will be devoted to extensive laboratories. These include an analytical laboratory, a plant control laboratory, a research and development laboratory and a biological laboratory. The cost of the building, including the equipment, is estimated at approximately one-quarter million dollars.

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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MAY MEETING OF THE NEW YORK SECTION

THE May meeting of the New York Section of the American Association of Textile Chemists and Colorists convened Friday evening, May 23, 1930, at the Alexander Hamilton Hotel, Paterson, New Jersey, P. F. Kingsbury, Chairman of the Section, presiding.

. . . Following the regular routine of the meeting the speaker of the evening, Dr. Hugh H. Mosher, Chief Chemist of the U. S. Testing Company, was introduced and presented his paper on "The Degumming of Silk." . . . (Applause)

The Degumming of Silk

By HUGH H. MOSHER
Chief Chemist, U. S. Testing Co.

THE text for this evening's discourse is listed as the "Influence of pH on Silk Degumming." That is the title that I furnished Mr. Herrmann a couple of months ago. However, upon reviewing the literature I found such a paucity of accurate and reliable information on the subject of silk degumming that it appeared desirable to modify the theme and make it embrace the entire subject rather than a single phase.

According to most text books raw silk is composed essentially of two substances: fibroin or silky matter and sericin, a glue-like substance that envelopes the former and renders the raw product harsh, stiff and lifeless. In order to develop the full brilliance, beauty and sheen of the silk and render it capable of acquiring dyestuffs and a satisfactory finish it is necessary to first remove the sericin vitiant.

It is implied that this can be rather easily accomplished in a hot soap or alkaline solution, though the statement generally follows that the best results are obtained by degumming in hot solutions containing from twenty-five to fifty per cent of the weight of the silk as pure olive oil soap and some even go so far as to specify some region from which the oil should be derived. Few articles make an effort to explain the preference of the trade for soaps derived from olive oil and most of these are fantastic and absurd.

I recall distinctly when I was a tyro in the textile industry of reading some article in a French journal dealing with the superiority of the finished silk manufactured in a certain district which will be nameless. The author attributed this superiority to the use of an olive oil soap derived from trees in the Alpine Valley. Here the trees absorbed the warmth of the southern sun, the clarity of

Mediterranean skies and loftiness of the Alps. These characteristics were imparted to the oil and surviving the soap-making process were given to silks washed or degummed in this soap. Rather a unique if not scientific explanation.

Under sericin we generally find in most text-books statements such as follows:

"Sericin is easily soluble in hot soap or alkaline solutions or even in hot water, though it is insoluble in dilute acids and may be fermented by certain proteolytic enzymes, of which trypsin and pepsin are specifically mentioned and several list sericin as soluble in ether."

Those of us who have had any experience with degumming whatsoever, know that the above information is incorrect. Sericin, as it occurs on silk, is not soluble in hot water, at least not up to a temperature of 212° F., is not completely insoluble in dilute acids, and is very unsatisfactorily fermented by the usual proteolytic enzymes, and as for being soluble in ether—I know of no reagent in which sericin is less soluble.

Raw silk contains, in addition to fibroin, two forms of a protein, which have been termed Sericin A and B, various oils and waxes, dirt and coloring matter.

I will discuss various factors influencing the removal of each of the above from silk as well as the effect of the reagents on the fibroin itself.

There are several other factors of importance in degumming. Silk is an amphoteric colloid by which I mean that being amphoteric it has the power of uniting with either acids or bases and sometimes both simultaneously to form complex salts, and being a colloid it has remarkable adsorptive powers. It is these properties of silk which renders soap the most advantageous degumming agent yet discovered, as will be explained later.

In many plants the gum-soap liquor finds use as a dyeing auxiliary. There are limitations to its use and when improperly prepared many dyeing difficulties arise. If time permits and you are not too fatigued I will treat with that phase of the subject rather briefly.

Hence in to-night's discussion I will serve you up a polyheaded creature which I hope you find not too indigestible and which might be grouped under the following heads:

1. Factors influencing the removal of sericin from silk.
2. Factors affecting the freeing of fats and oils.
3. Elimination of natural silk pigments.
4. Amphoteric and colloidal character of fibroin and its commercial importance.
5. The chemistry of gum-soap liquor.

Factors Influencing the Removal of Sericin from Silk

Under this heading three factors were given consideration, namely, pH, time and temperature. I really don't believe that it will be necessary to explain the meaning of pH. So much has been written about it in recent years that you all doubtlessly have given the matter some thought and study and know that in all solutions we have both hydrogen and hydroxyl ions, and the predominance of the one over the other determines whether that solution is acid or basic. If an excess of hydrogen ions are present the solution is acidic, and conversely an alkaline solution is one containing a surplus of hydroxyl ions. Where absolute parity exists we have neutrality.

A solution may have a very large excess of either free hydrogen or hydroxyl ions, in high concentration, a moderate concentration or only a relatively slight predominance of the one over the other and that determines whether that liquor contains a strong acid or base, one of moderate strength, or is weakly acidic or alkaline.

To quantitatively express the degree of acidity or basicity that a solution possesses a scale has been developed with integers running from 0 to 14. This measure is known as the hydrogen ion scales and the units as pH. It matters not for the present discussion how that scale was developed. That belongs to the realm of physical chemistry and most of you are familiar with it anyway. All the integers below 7 represent degrees of acidity and those above alkalinity, while 7 itself is the division representing neutrality, the point where an absolute parity of hydrogen and hydroxyl ions exist. The more remote the number from seven the higher its acidic or basic properties. Thus our strongest acids such as hydrochloric, nitric and sulphuric form solutions of pH values ranging below say one, our moderately strong acids like oxalic and phosphoric between one and two, while the weaker acids such as acetic, hydrocyanic and boric generally give solution values between two and six. Conversely our bases give solutions with pH values greater than seven. The strongest, such as the caustic liquors, may run up as high as fourteen for a normal solution with correspondingly lower values for the weaker alkalies.

It has been shown, in recent years, that for many (I was about to say most) operations of a chemical character in a textile mill that the pH of a solution is a factor of definite practical importance. In the dyeing operation, for an example, the adsorption of the dyestuff depends and is conditioned not upon the auxiliary chemicals present but to the pH which these chemicals impart to the solution.

Accordingly, the speaker in his studies on silk degumming sought first to determine whether the elimination of sericin from raw silk was a pH phenomenon or whether the salts themselves exerted a gum solvent action. The results demonstrated that the hydrogen ion concentration of the stripping solution was the determining factor.

Soaps, whether of oleic, palmitic or stearic acid origin were equally satisfactory as far as sericin removal is concerned as were mixtures of alkaline salts, when their solutions possessed the same pH values and when that value was manitained throughout the degumming opera-

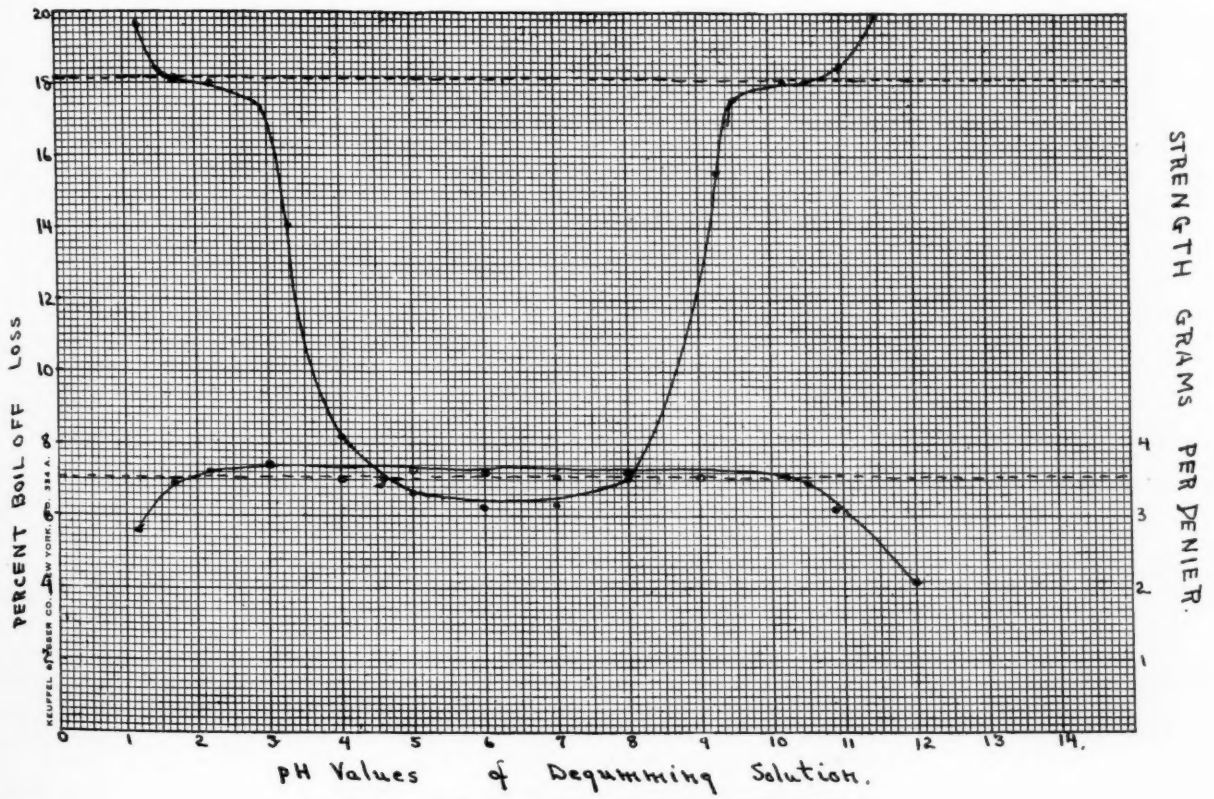
tion. Quite a medley of compounds were experimented with—such as the caustic alkalies buffered to 10.2 by various salts, the two phosphates of sodium di- and tri-sodium phosphate; sodium carbonates, silicate and sulphite. Note that I said as far as sericin removal is concerned and not equally suitable for degumming purposes. There is more to degumming than sericin removal. Silk boiled off merely with alkaline salts was generally dirty in appearance, of yellowish cast and possessed a thinner, harsher hand than comparative samples scoured in soap.

Having established the premise that the rate and thoroughness of degumming is dependent upon the pH of the stripping solution, experiments were arranged designed to establish the optimum pH for degumming.

An excellent quality of raw Japan singles having a very low ash, wax and fat content was secured and this served as the media for experimentation. The reason for selecting stock of this type was to eliminate as far as possible any influence that extraneous contaminants might have on sericin removal. The raw stock was wound into skeins of about five grains each. Such skeins, however, did not lend themselves conveniently to the purpose of making strength tests. To accomplish this three threads of the raw were wound into a three-thread tram with an average twist of three turns per inch. The yarn sized as a 13/15 tram.

The degumming solutions were prepared by taking distilled water and adding thereto the necessary reagents required to furnish liquors of pH values covering the whole range of the hydrogen ion scale from one to twelve. Although it had been demonstrated that degumming was dependent upon the degree of alkalinity or acidity rather than upon the salt present in solution, the speaker attempted to confine the variety of chemicals employed to as small a number as possible to eliminate the likelihood of salt errors. In the acid range a one-tenth per cent hydrochloric acid solution was employed to obtain a pH of one, and tartaric acid solution to yield two and between two and five the tartaric acid was buffered with varying amounts of sodium hydroxide or caustic soda. The pH values between five and nine were obtained with varying mixtures of mono and disodium phosphates, the sum of the two being always fixed at a one per cent aqueous solution. At the lower value (pH 5.0) the almost pure monobasic salt was used while at the higher value the disodium phosphate was employed. One per

CHART 1



Boil-Off Loss and Strength on Yarn Degummed at Indicated pH Values
Time 30 minutes—Temperature 212°F.

Upper Curve Represents Boil-off Loss: Lower Curve Represents Breaking Strength

cent olive oil soap solutions or solutions of the same reinforced with soda ash or caustic gave the more alkaline degumming liquors between pH 10 and 12.

Some difficulty was experienced in maintaining a constant degree of acidity or alkalinity during scouring. Fibroin, sericin and their decomposition products are all amphoteric, that is, they possess the power of combining with either acids or bases and forming salts. If they are brought in contact with, let us say, a boiling soap solution, the hydroxyl ions are in part neutralized by some of the acid radicals in the silk and the solution becomes less and less basic and the stripping potency of that liquor is reduced. In fact, if but a small amount of soap was originally present it may drop to a point where degumming actually ceases and be valueless for a scouring bath. In order to maintain a constant hydrogen ion concentration throughout stripping predetermined chemical additions were added to the degumming liquors every five minutes. The ratio of the raw stock to liquor was at one to fifty, the period of exposure affixed at thirty minutes and the temperature maintained at 212° F. After the degumming operation was complete, the stock was hydroextracted and the amount of chemicals absorbed removed by the use of suitable solvents. The results are expressed graphically on Chart I.

In order that you might the more readily note the relationship existing between losses in silk strength during degumming and ease of removing the sericin I have plotted the silk boil-off losses and loss of strength against the solutions pH value on the same chart.

Before analyzing the results a word regarding the method by which the stock was prepared for strength test determinations. At certain pH's the silk was degummed to only a slight degree, leaving the bulk of the sericin about the fibres as a glue-like lacquer or size. This varnish adds strength to the yarn and would render any comparative conclusions that might be reached erroneous. We all know that raw silk is from ten to thirty per cent stronger than properly degummed stock. That doesn't mean that the stripping operation has injured the fibroin to that degree. It simply means that the sericin envelope has added that amount of strength to the stock or some fraction thereof. In order to obtain all samples at a comparative sericin content all the skeins before testing on a Scott tester were treated together in a boiling soap liquor for 15 minutes.

A study of the chart reveals several interesting and important facts. The dotted line between the abscissas eighteen and nineteen represents the boil-off loss of the raw stock obtained in accordance with the standard method with one correction only. The speaker has found that silk prepared in that manner always contains some soap. In order to eliminate this soap, the skeins, subsequent to boil-off, were very thoroughly extracted with boiling alcohol, as it was found that this solvent completely removes all traces of soap from silk. The lower dotted line represents the breaking strength in gms. per denier of the tram prepared in accordance with the conventional boil-off method. Hence, both of these lines serve as units for comparison.

The chart shows that there are two pH bands on the hydrogen ion scale in which complete removal of sericin from silk can be readily accomplished at a boiling temperature; one above pH's of 9.5 and the other below pH's of 2.5. As the pH's of the solutions deviate more and more from the neutral point an increase in loss of substance occurs, and this loss becomes acceleratingly accentuated above 10.5 and below 1.7. You will note that at about these points the curve crosses the dotted line. What does this mean? It indicates that the silk itself is beginning to suffer digestion and deterioration. That is verified by the strength test curves. You will observe that between solution pH values of 1.7 and 10.5 the curve is practically a straight line, but that from these points toward the ends of the hydrogen ion scale the silk shows evidences of decided weakening. The chart furnishes conclusive evidence that the pH limits for degumming should lie between 1.7 and 10.5 and moreover on the flattened plateaus between 9.5 and 10.5 and 1.7 and 2.5.

In the middle of the scale between 3.5 and 8 a flattened sector occurs in which about six and one-half per cent boil-off loss takes place. Raw silk contains both Sericin A and B. The former is readily soluble in boiling water and it is probable that between these values it is the form of the sericin being removed, and that the "B" modification is not eliminated to any extent unless more acid or alkaline solutions are present.

Of what value is this and how can it be made of practical importance? Silk is amphoteric, as I have stated several times in this address. It has the power of combining with either acids or bases and forming salts or other complex derivatives. Hence it is very difficult to maintain a degumming solution at its initial pH. If we should perpare solutions containing ten, twenty, thirty, forty and fifty per cent neutral anhydrous soap on the weight of the silk to be degummed and use these liquors for stripping purposes, we would find some very interesting information. The initial pH's of the five solutions would not vary very much. They would range from perhaps 9.8 to 10.3 with the highest value, of course, representing the most concentrated soap solution. All of those values are on the plateau of the chart or band of effective degumming, but after stripping starts the basic potency of the liquors rapidly falls off. The least concentrated soap solution would be down to a pH of 8 or thereabouts within the first five minutes. You will note from the chart that effective degumming is impossible at that alkalinity. With the more concentrated solutions more alkaline reserve is present and the drop is much less. In fact the alkalinity of a forty or fifty per cent solution

would fall only four or five points to about pH 9.7 or 9.8. While that loss is notable the stripping power of the solution is still in the band of effective degumming. That explains the reason for the use of relatively concentrated soap solution in silk scouring. It is done so that sufficient alkaline reserve is present to maintain a pH of at least 9.5 throughout the operation. It also furnishes one reason to account for many of the failures of certain soap substitutes to meet acceptance by the trade. They lacked the necessary alkaline reserve. The silk combined with the active hydroxyl ions leaving for stripping purposes only an inert salt or salt oil combination not possessed with satisfactory degumming properties.

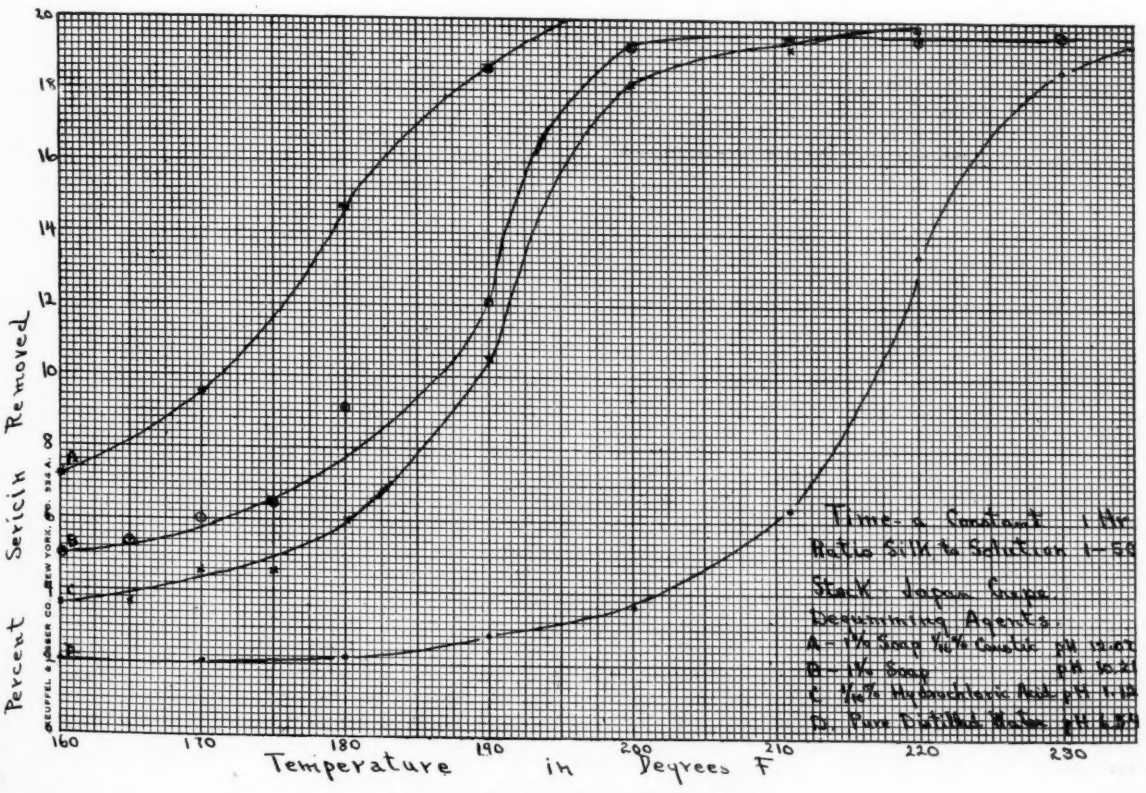
But does pH tell the whole story regarding sericin removal? No, not entirely. Certain neutral salt solutions, generally rather concentrated, may and do have a very positive solvent action and others have a reverse influence. However, at least all such with which the speaker has had experience are too costly to be of practical value. Oxidizing and reducing agents likewise influence sericin solubility but that is a long story and will not be treated with to-night. In general it might be stated that barring a few inorganic salts and oxidizing and reducing agents that the pH of a degumming solution is a factor in sericin solubility and is not influenced by the reagents added to a solution to obtain it.

The Time Factor in Degumming

From a standpoint of both quantity and quality of production the time of degumming is a factor of tremendous importance. Speed is desirable because naturally the shorter the time required to boil off a batch of silk the greater the production from a given installation and less the opportunity for the immersed stock becoming depreciated in quality through mechanical and chemical action.

We have just seen that between the pH range of 2.0 and 10.5 there is but little difference in the rate of fibroin deterioration at a one-half hour exposure to a boiling solution. Water is but little milder in its action on silk than a soap or tartaric acid liquor. In fact I am not at all certain that it is any. I have repeatedly attempted to develop a formula or equation by which the rate of fibroin hydrolysis could be computed at some given pH and temperature but have never been successful. Silk, as might be expected, is slowly decomposed in all boiling solutions but at practically the same rate between pH value of 2 and 10.5, and I am very certain that a two hours' boil in pure water will produce a greater adverse action

CHART II



Influence of Temperature in Degumming Rate

on silk than a one hour treatment in a soap or one half of one per cent tartaric acid solution at the same temperature.

Of course if given sufficient time silk can be degummed in boiling solutions at any pH value, but since the rate of deterioration is essentially the same over quite a wide range of the hydrogen ion scale it is obvious that silk degumming should take place in solutions of pH values producing the maximum rate of stripping with a minimum deterioration of the stock.

We have seen that the rate of degumming increases with acidity and alkalinity but is dependent probably more on temperature than any other factor and this will be given consideration next.

The Temperature Factor in Degumming

When I first prepared this paper it was my intention to treat with this factor very briefly. It was my impression that from a qualitative standpoint this phase of the degumming operation was very thoroughly understood by practically every member of the silk industry. However, in my contact with various members I find that but few apparently realize the magnitude produced by just a few degrees. Many are of the belief that almost any temperature in excess of 180°F. is about equally effective in removing sericin from silk.

Accordingly for this meeting I have prepared a chart illustrating the influence of time in stripping sericin from silk, all other factors remaining a constant. Unfortunately the stock employed to secure this data was not the same quality as that obtained for making my tests on the influence of pH on degumming, but was made on swatches of a rather heavy canton crepe, the cloth being composed of Crack XX Japan Stock 77 turns per inch. The yarn from which the material had been derived had been rather heavily soaked in soap and oils and all the data shown on the chart represents loss in sericin only and not sericin plus soap and oil.

The real influence of temperature is readily apparent from the curve. Four curves are shown which I have termed A, B, C and D. The uppermost or A represents data obtained with a soap-caustic combination while the lowest or D is the curve obtained with pure water. The lines in the middle of the chart B and C show the amount of sericin removed by soap and hydrochloric acid solution respectively. At temperatures below 180°F. very little degumming action takes place with any of the reagents employed with the exception of the soap caustic combination, but as the temperature rises above this point the increase in the amount of gum removed is extraordinarily rapid, and leaves no doubt as to the practical value of this factor.

Pure water does not appear, however, to have much solvent action on sericin until a temperature of about 220°F. is reached. Above this temperature water completely frees fibroin from its sericin envelope in a reasonable period of time.

The figures shown in the chart indicate that the speed of degumming is enormously increased by both an increase in the alkalinity of a solution and an increase in temperature. While it has been demonstrated that at the boil any solution with a pH value in excess of 10.5 exerts some discernible adverse influence on silk it does not necessarily follow that the same limiting value would hold for lower temperatures.

In order to determine this, experiments were arranged to estimate the minimum time required to strip silk at temperatures varying between 170°F. and 212°F. with pH values also varying between 9.6 and 12. The material employed for these tests was Canton Crepe of the Type used in the preceding experiment. The results appear on Chart III.

In all cases the ratio of silk to solution was affixed at one to fifty, and the pH of the degumming solution maintained at its initial value by periodic additions of a predetermined amount of some chemical exactly as was done in the experiments on the influence of the hydrogen ion concentration on stripping.

The results show conclusively that increasing the pH of a solution and shortening the time of degumming does not prevent damage by deteriorating chemicals. An olive oil soap-caustic combination produces considerable damage to silk in the time required to degum and the same condition prevails where soda ash is substituted for the hydroxide though to a lesser degree.

By reducing the temperature and increasing the time to compensate the solution for its reduced stripping potency does not appear to be advantageous. Silk seems to be deteriorated to as great a degree by the longer period necessary to affect degumming at a lower temperature as it does in a boiling solution with the shorter time required.

From that which I have stated in this address it might appear that we have two classes of stripping agent; those of an alkaline character of which soap is the most used example and those of an acid nature among which might be listed oxalic, citric, tartaric or even suitably buffered sulphuric or hydrochloric acid. I feel sure that in more than one mind possible uses for acidic degumming methods suggest themselves. Certain gum-silk worsted, gum-silk celanese, mordanted crepes combination and even silk waste could apparently be stripped to good advantage by acids if sericin was the only raw silk vitiant to consider, but there are several flies in the degumming ointment; other impurities are present. It has been shown that raw silk contains, in addition to sericin, oils and waxes.

Factors Influencing Removal Oils and Wax From Raw Silk

Ordinarily in the soap degumming process these are given scant consideration. They are known to be present, in fact during weaving the tram and organzine are in-

variably treated with soap and oil and sometimes even with a mineral oil, though in the case of pure silk, but rarely. However, they are so readily removed by soap solutions that converters are hardly aware of their existence.

If, however, raw silk were to be stripped with acid or even certain alkaline reagents the removal of these impurities would assume considerable importance. Acids have neither fat solvent nor fat emulsifying properties and whatever greases were present in the raw stock would survive an acid degumming operation possibly collecting in oily envelopes over the sericin and fibroin and preventing or at least inhibiting the stripping action of the acid. The result would be that the acid degummed stock would be gummy in pieces and contain many oily and waxy spots. These imperfectly scoured portions resist dye absorption, the action of bleaching agents and only a very streaky article would be likely to result.

It has been the speaker's experience that these fats and waxes are by no means as readily removed as is sometimes assumed to be the case. They may be pretty firmly affixed onto the fiber by baking or mordanting and at times give trouble. Alkaline reagents other than soap are not very effective in effecting their removal though, generally speaking, the higher the alkalinity of the solution the more complete the elimination of oils and waxes from the treated fabric. Soap which is rather unique among chemicals in reducing most greases to a colloided state ordinarily completely emulsifies this class of impurities and removes them from silk. This fact contributes another reason for the almost universal employment of soap as a degumming agent.

However, other colloids have and are being discovered which approximate soap as an oil emulsifying agent. It is probable that some one of these might be used to good advantage in conjunction with acids or alkaline salts and yield a final product equal to that obtained with soap. That is a problem for future development.

Factors Influencing Removal of Raw Silk Pigments

What little coloring matter occurs in raw silk generally is found in the external sericin layer, and is easily removed during the degumming operation with the gum. But when once fixed in the fibroin it is removed with the utmost difficulty and usually requires some form of bleach in order to destroy it. Hence it is very desirable to prevent this fixation.

It has been found that soap and alkaline solutions emulsify this dyestuff and prevent it from dyeing silk to any extent and, generally speaking, the more alkaline the solution the more complete the emulsification and the smaller the amount of pigment fixed on the fiber. This has in the past induced some converters to reinforce the basicity of their degumming soap solution with soda, trisodium phosphate and even caustic for the purpose of obtaining a better color. That such practices are not desirable is apparent from a study of Chart I. The men-

CHART III

Time Required to Completely Degum Crepe at Varying Temperatures and pH

Degumming Agent		pH of Solution	Temperature	Minimum Time for Complete Gum Removal	% Silk Strength Compared to Stand.
1% Olive Oil Soap	1/16% Caustic	12.07	212°F.	18 Mins.	75
"	"	12.07	200°F.	27 "	82
"	"	12.07	190°F.	55 "	70
"	"	12.07	180°F.	90 "	72½
"	"	12.07	170°F.	4 Hrs.	82½
"	¼% Soda Ash	10.87	212°F.	40 Mins.	88
"	"	10.87	200°F.	60 "	90
"	"	10.87	190°F.	1½ Hrs.	90
"	"	10.87	180°F.	3 "	95
"	"	10.87	170°F.	6 "	90
"	—	10.22	212°F.	50 Mins.	100
"	—	10.22	200°F.	70 "	102
"	—	10.22	190°F.	3 Hrs.	97
"	—	10.22	180°F.	8 "	100
"	—	10.22	170°F.	24 "	95
"	¼% Borax	9.61	212°F.	1½ "	100
"	"	9.61	200°F.	2 "	105
"	"	9.61	190°F.	6 "	97
"	"	9.61	180°F.	18 "	98
"	"	9.61	170°F.	+24 "	90

tioned auxiliary chemicals all add to the basidity of the stripping liquors and force it up into that portion of the hydrogen ion concentration scale where the silk suffers deterioration. Acids, however, have no such emulsifying properties, and instead of producing a white colored degummed stock, actually aid the fibroin in absorbing the natural silk pigments. Of course, therefore, silk degummed in acid is always much yellower in cast than the same product stripped with soap. Another drawback to the use of acids as degumming agents.

Importance of Soap Weighting

Most silk manufacturers are aware of the fact that of all the possible degumming agents soap causes the least loss of raw silk substance and produces a stock with a fuller, softer hand, even though the stripping liquors are maintained at the same pH. This is generally attributed to the fact that soap is milder in its action and causes less damage. Such, however, is not always the case.

Fibroin is a colloid drawn out in the form of a thread and as such exhibits most of the properties of this class of substances. Among these must be listed the power of absorbing other colloids and compounds of high molecular weight. You are all familiar with the remarkable affinity of silk for dyestuffs; know how it can be weighted with tannic acid, sugar and tin salts. In a perfectly analogous manner soap is taken up out of boiling solutions and affixed in the fiber, and when once adsorbed shows the same resistance against removal that a dyestuff will. The amount occluded, to be sure, is much less than the quantity of tin capable of being fixed, seldom exceeding two or three per cent. This soap weighted silk, however, resists removal by washing and is not altered chemically by acids. You all know that when an acid is added to a soap solution a chemical reaction takes place. The sodium enters into combination with the anion of the acid forming a salt and a fatty acid is liberated. Some such reaction might be expected when soap weighted silk is brought in contact with an acidic solution. Instead a light film of fatty acid coats the fiber and the acid is unable to penetrate into the fiber thus leaving the soap largely intact. This soap gives body to the silk, imparts a feeling of springiness, loftiness and softness not present in fibroin freed from its gum by other alkaline liquors.

That these characteristics are imparted by the soap adsorbed and not by some mysterious undiscovered factor can be easily demonstrated by removing the weighting agent with boiling alcohol and adjusting the fat content of the treated sample to that of the untreated. The difference in hand is unmistakable. It is this property of silk to become soap weighted that has lead to the almost universal use of soap as a degumming agent. Articles have appeared stating that no other chemical will produce as satisfactory a color or remove pigments as well. That is not entirely correct. The speaker has developed formulae which yielded a whiter stock and removed oils and extraneous matter practically as well. Such stock, however, never possessed the elastic, full hand of soap degummed silk nor did it show as great a resistance against chafing.

Soaps weight silk and give body, elasticity and softness and future developments may be expected along the line of improving these physical characteristics and any new degumming agents that may be developed will probably weight silk just as does soap and will probably impart in addition a fuller hand elasticity and softness.

Silicates and aluminate supply the body but simultaneously produce harshness and brittleness, two undesirable characteristics only very imperfectly counteracted by oils. Are all soaps equally satisfactory for degumming? By no means. The soaps must yield the requisite degree of alkalinity to solutions, must show considerable resistance against the development of rancidity, must possess sufficient fluidity when adsorbed by silk to impart softness and body and, above all, must be easily removed by washing—that is any excess adhering to the outside of the fibers must be removed just as an excess of dyestuff is eliminated.

An olive or a red oil soap most nearly meets these requirements and are therefore the soaps most generally employed.

This completes my discussion on degumming, but before summarizing this subject I will present a few words on the chemistry of gum soap liquors used as an auxiliary in dyeing operations.

Gum Soap Liquors

In many mills all silk dyeings with acid colors are made in acidified gum soap liquors. It is claimed that such a dyeing auxiliary produces better and more level shades and protects silk luster against deterioration. Although various salt solutions have replaced gum soap liquors to some extent, particularly in piece-goods dyeing, the latter is still commonly used.

Difficulties, however, occasionally result; the liquor appears to break down, oils separate out and the goods being worked in the solution comes out soggy and streaked. No very satisfactory explanation for the trouble is ordinarily given. The dyer generally attributes such a condition to the use of an improper degumming soap, or warp size and even air, light and water come into question. Frequently an iridescent appearance is noted on the top of the dye liquor and this is exhibited as irrefutable evidence that the difficulty is due to an excessive oil content in the silk.

The speaker has investigated several epidemics of streaky, greasy dyed cloth and in every incident found that the difficulty could be traced to an improperly prepared gum soap dye liquor. This solution ordinarily contains soap the two forms of sericin occurring on raw silk and their decomposition products, minute quantities of

silk oils and waxes, warp sizing materials and miscellaneous ash impurities.

It is known that soap breaks in acid solutions, that it is decomposed into a salt and fatty acid, and as such is valueless as an emulsifying agent, and the ash, oils and sizing materials are present either in too minute or variable quantities to be of value as leveling agents. Therefore we must look to the sericin fractions and study their properties to obtain information concerning the value of gum-soap as a dyeing auxiliary.

The sericin fractions are readily separated from each other by bringing the liquor containing them to a pH of four. Upon examining the two sericin fractions it was found that Sericin A was not a good oil or dye emulsificant. Sericin B, however, possesses, when properly peptized, truly remarkable dispersing and adsorptive properties, forming very stable emulsions with oils, fats and waxes and absorbing large amounts of dyestuffs.

When dyestuffs are added to a solution containing peptized Sericin B, the colloid immediately adsorbs large amounts of the color leaving only a relatively small quantity in true solution. The occluded pigment does not, however, appear to be very firmly bound, and the amount held captive appears to be in equilibrium with a certain solution concentration. The speaker has found that if in any way the dyestuff is removed from solution, a certain amount of the adsorbed color contained in the colloid is fed to the liquor until a definite relationship exists between the concentration of the pigment in solution and that contained on the sericin. By removing the dyestuff from solution as quickly as it forms it is possible to remove all of the coloring matter from the colloid. The sericin acts like a dyestuff reservoir.

In the dyeing of silk this factor is of the greatest importance. The fibers can adsorb only that portion of the dyestuff in true solution or unattached to sericin. As silk is absorbing the relatively small amount of color from solution more is being fed in from the colloid and the result is similar to that of making constant small additions of dyestuffs uniformly throughout the entire liquor. Sericin has excellent penetrating powers and readily pierces and penetrates skeins of silk and folds of cloth. When the gum particles bearing coloring matter pass the filaments in the innermost part of a skein the liquor about the filaments may be almost free from dyestuffs and the fibers greedy to adsorb it. Under those conditions the colloids readily are freed from their occluded pigments and the interior of the skein colored. The penetrating and absorbent properties of Sericin B account for its leveling properties.

I have stated previously that there were limitations to the use of gum soap as a dyeing auxiliary. Sericin B is precipitated from solution at a certain definite pH value and under such conditions all of its value as a dyeing component ceases. It no longer feeds color into solution, no longer holds emulsified the oils derived from soap through acidification. These oils collect on any silk being dyed making the stock greasy and soggy and very unevenly colored. Complete coagulation occurs at around a pH of 4, but a partial precipitation may occur at several points on either side, say between 3.8 and 4.2.

Of course, most acid dye liquors are supposed to be much more acid than pH 4. In many mills the proper maintenance of acidity is left in the hands of the dyeing foreman or some deputized representative of the requisite acidity estimated by experience and sense of taste. I had occasion in one incident to check up on such a foreman. I presented to him a series of beakers containing his dye liquors adjusted to pH values ranging from 1 to 6 and asked him to estimate the suitability of the solutions for dyeing purposes as far as acidity was concerned. I recall only too clearly that he pronounced one solution of pH 3.75 as satisfactory and rejected another considerably more acid as too alkaline.

A liquor of pH 3.75 is very close to the breaking point of Sericin B and it would require but little imagination to expect many broken dye baths in the mill engaging the foreman alluded to. Thus one cause of defective dyeing where acidified gum soap is the leveling agent is lack of the requisite acidity or the development during dyeing of a pH value of approximately four in the dye bath due to the fact that the stock being colored had not been completely freed from its alkaline degumming agents by proper washing after boil-off.

There are other sources of difficulty besides an improper pH in preparing acidified gum soap liquors. Sericin B, the emulsifying agent, is a relatively unstable compound. It comprises the major portion of the gum content on raw silk. In fact, it is not improbable that all of the gum is present in that form when the silk worm first spins his cocoon and that ageing and weathering conditions gradually effect decomposition converting Sericin B into the A modification. Be that as it may, the speaker has found that when the former is boiled with water it gradually changes in composition and is transformed into Sericin A. With water alone the transformation is very slowly effected but is rapidly accelerated by either acids or bases. In solutions up to the alkalinity of soap the decomposition of Sericin B while considerable is not complete. In liquors of slightly greater alkalinity a complete transformation occurs and those liquors are valueless for purposes of preparing a leveling agent. The rate of decomposition is indicated by chart. You will observe that in solutions about the neutral point Sericin B is comparatively stable and suffers but little chemical transformation. However with rising acidity or alkalinity the decomposition is acceleratingly increased and is practically complete at a pH of 10.5 on the alkaline side of the hydrogen ion scale and 3.0 on the acid.

Where we are dealing with liquors derived from soaps

containing soda ash or caustic those solutions have sufficient alkalinity to effect a very complete decomposition of the active sericin and the liquor possesses too small an amount of the leveling agent to be of value as a dyeing auxiliary. Thus a second cause of trouble with acidified gum-soap liquors is due to the use of too alkaline soaps for degumming purposes which excess basicity decomposes Sericin B. Various salts tend to prevent peptization of sericin by soap and without such a reaction the silk is valueless as a leveling agent.

The speaker is at the present time continuing his work on these anti-peptizing salts and has not advanced sufficiently far to draw conclusions from his data. Enough work has been accomplished to justify the belief that some very interesting results will be the outcome.

SUMMARY

In this evening's discourse the speaker attempted to bring out the following facts:

1—The degumming operation is not solely a sericin removing process but that the oils, waxes and pigments present in raw silk must be given consideration.

2—The elimination of sericin is a pH phenomenon depending upon the hydrogen ion concentration and temperature of the degumming liquor.

3—The optimum pH for degumming lies somewhere between 10 and 10.5 on the alkaline side and 1.75 and 2.5 on the acid.

4—Little degumming takes place below a temperature of 180°F. but that as the temperature increases above this unit the increase in sericin solubility is extraordinarily rapid.

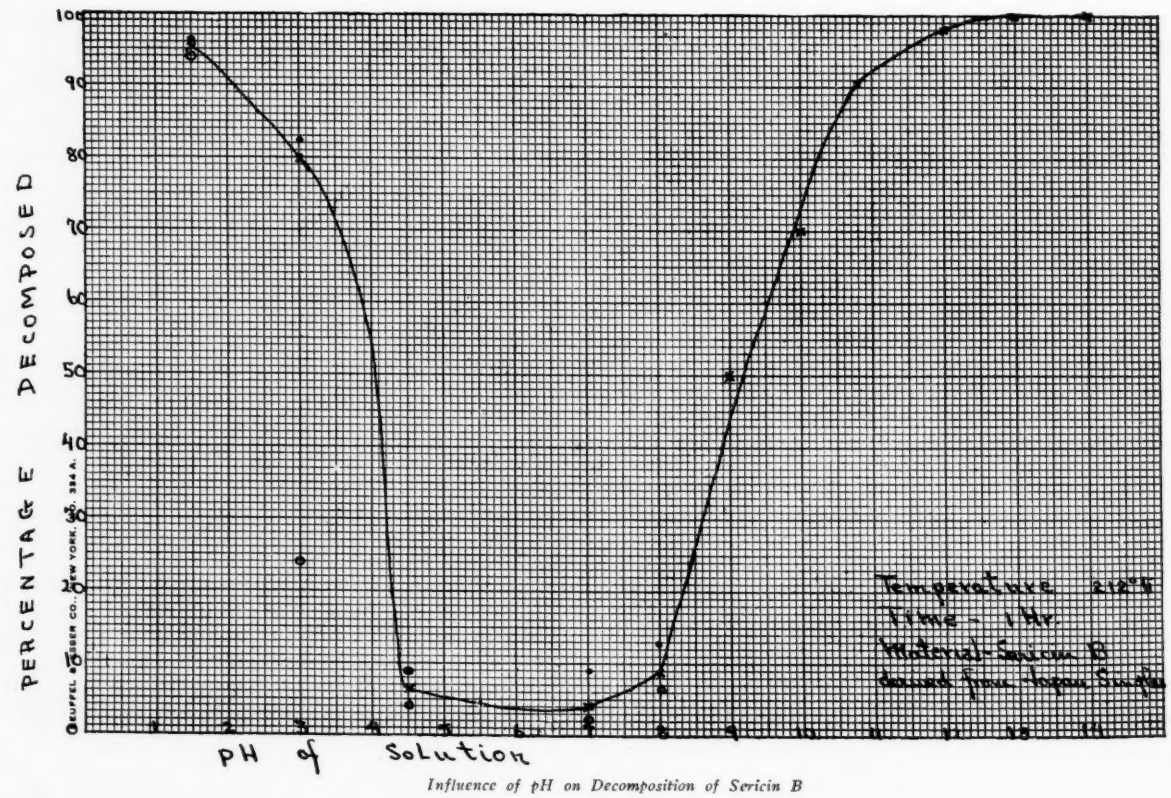
5—No quality advantages appear to result through lowering the temperature of degumming and increasing the time, or increasing the alkalinity of the stripping liquor and reducing time, temperature, or both.

6—Soap is the most effective remover of soap, oil and pigment from raw silk and partially accounts for its universal use as a degumming agent.

7—Silk degummed in soap becomes weighted with the latter and this weighting accounts for the superior body, hand and elastic spring of the soap stripped product.

8—Gum soap liquors owe their values as a dyeing auxiliary to the presence of Sericin B. That this chemical being unstable in strongly alkaline or acid solutions breaks down and is converted into Sericin A, thus causing dyeing difficulties. Other dyeing difficulties arising from the use of gum soap as a dyeing auxiliary is the tendency of Sericin B to precipitate from solution at pH 4.

CHART IV



Influence of pH on Decomposition of Sericin B

Discussion

Chairman Kingsbury: I am sure Dr. Mosher will be glad to answer any questions if there are any to be cleared up.

P. J. Wood: I understood in the experiments carried out that after boiling-off temperature you found it wasn't advisable to increase the pH above 10.5. I was wondering if you had tried to influence it by increasing the pH and lowering the temperature.

Dr. Mosher: Yes, I tried to influence it in that way. That is a subject which I didn't discuss to any great degree this evening. I have tried degumming with a pH of 12 and with a pH of 11, lowering the temperature, and the result was that the longer time required to effect degumming brought about almost as much loss of silk strength as degumming by a higher temperature for a shorter period of time.

Member: There are a good many silk hosiery mills that are boiling off with sodium silicate solutions, or mixtures of sodium silicate solutions, or quite often saponified Turkey Red oil. A great many of them seem to be having some difficulty with them. I should like to know your opinion concerning them.

Dr. Mosher: Sodium silicate will give pretty good body. If they add sufficient sulphonated oil it will bring the pH down to about 10.5 or less. It can then be used successfully as far as deterioration of silk is concerned. However, very frequently in the mills no effort is made to maintain their pH. They just use sufficient sulphonated oil, which experience has shown gives satisfactory results. In some cases that pH will drop down as low as 9.8 or 9.9 in which case we know of no difficulty as far as strength is concerned. In other cases the pH will be up around 11. Under those conditions difficulties are bound to arise.

Member: One of the difficulties seems to be particularly with mineral oil where they have scum in the bath.

Dr. Mosher: Using mineral oil in conjunction with sulphonated oils?

Member: How would they get spots?

Dr. Mosher: Sodium silicate is not a very good emulsifier of mineral oil.

Member: It is generally used in connection with some other oil compound, either a soap or a sulphonated oil compound.

Dr. Mosher: I am not familiar with that. I do know this much: that sodium silicate would be a very poor agent to remove mineral oil; the sulphonated oils in some cases have pretty fair emulsifying action, but would not be likely to result in complete removal of mineral oil and this might give rise to trouble.

Member: That combination is pretty universally used in the South. Very few of them use soap baths. And they use it in a one boil bath, oil and dye bath—

Dr. Mosher: Do they use mineral oil in conjunction with it?

Member: A good many seem to be attempting to and they are having trouble.

Dr. Mosher: The reason they are having trouble is probably because they are not removing it satisfactorily with their silicate and sulphonated oil.

Member: Is soap a more effective agent in that case?

Dr. Mosher: Soap is a more effective agent although a mineral oil is not very easily removed by soap when the mineral oil is once thoroughly fixed into your silk.

Member: Is that true of white mineral oil?

Dr. Mosher: All the qualities I have had experience with were removed from silk with some difficulty. I might qualify that and say they were removed with a great deal more difficulty than the ordinary vegetable oils.

Member: When you have an acid boil-off bath do you have the gum coagulating in masses or do you have a dispersal as you do in an alcohol and oil bath?

Dr. Mosher: It is the same as it would be in an oil and soap bath. There would be no tendency for the gum to coagulate.

Member: The gum seems to form aggregates with the sodium silicate. That is the experience I have had.

Dr. Mosher: I don't think the gum has formed the aggregates. I think you will find more probably that it is the oil.

Member: It seems to be a combination of that and the dirt and anything else that might be present, but it seems to me there is all sorts of isolated gum, too.

Dr. Mosher: It is just possible although I have never noted that particular tendency. Personally I haven't done a great deal with silicate. I have made a certain number of tests particularly in testing out the strength. It didn't seem to be a very profitable means of experimentation. For that reason I didn't try a great many experiments with it.

Member: It is very apt to give a harsh hand.

Dr. Mosher: It gives a harsh hand and an unpleasant hand and that harsh unpleasant hand is not entirely removed by sulphonated oils.

Chairman Kingsbury: Are there any further questions?

I thank you, Dr. Mosher, for your interesting lecture. We have all enjoyed it very much indeed.

Gentlemen, the next business is the report of our Nominating Committee for next year's officers. I will call on Mr. Wood to present that report.

P. J. Wood: Mr. Chairman, after a long and stormy meeting of your Committee the following slate is reported:

For Chairman—Robert H. Gaede

For Vice-Chairman—Henry F. Herrmann

For Secretary—Clemens F. Hoppe

For Treasurer—John J. Sokolinski. (Applause)

. . . Upon motion regularly made and seconded, it was voted that the Secretary cast one ballot for the names submitted. The ballot was cast and the gentlemen nominated were declared elected . . . (Applause)

. . . Upon motion regularly made and seconded, it was voted that the usual annual outing be held this year, as heretofore. Mr. Wiehl was appointed Chairman of this committee (to select the other members of the Committee, himself) to arrange for the outing, the date, and all the other necessary arrangements . . .

. . . There being no further business the meeting adjourned at nine-forty o'clock . . .

ASSOCIATION BADGES

The lapel button badge illustrated herewith is worn by members of the American Association of Textile Chemists and Colorists.

The three "rings" are enameled in red, yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

ALEX. MORRISON,
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AMERICAN DYESTUFF REPORTER

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THE TEXTILE FOUNDATION DIRECTORATE

PROMPT action in constituting the board of directors of the Textile Foundation is a happy augury. It was on June 10th that President Hoover signed the bill creating the Foundation which is authorized to receive from the Textile Alliance a sum of more than one million dollars realized through the sale in this country of German dyes that has been impounded by the Reparations Commission. Having in mind the use of these funds for the textile industry's betterment, the President on approving the bill characterized the legislation as "a useful incident in the development of scientific research."

Directly after signing the measure the President announced the appointment of three men who, with Secretary Lamont of the Department of Commerce and Secretary Hyde of the Department of Agriculture, make up the directorate of the new Foundation. The directors who were chosen are Franklin W. Hobbs, president of the Arlington Mills and also president of the National Association of Wool Manufacturers; Stuart W. Cramer, president of the Cramerton Mills and a past president of the American Cotton Manufacturers Association; and Henry B. Thompson, president of the United States Finishing Company—all prominent figures in the industry and fully prepared to approach the subject of research from many years' practical experience.

The personnel of the directorate of the Foundation is one to inspire confidence that the administration of the moneys will be both conservative and far-seeing. There must be determination of the way that research most properly and effectively can be encouraged, and at the same time, no important branch of the textile industry likely to profit as the result of such research should be overlooked. Of course, the program cannot be developed without careful study. It is because men like Mr. Hobbs, who has been made chairman of the Foundation board, Mr. Thompson and Mr. Cramer bring to their new and important duties such thorough familiarity with the needs of the textile industry that there is reason for confidence in the outcome of their deliberations with Secretaries Hyde and Lamont.

The interest of the Government in the success of the enterprise is shown not only by the membership on the board of the two Secretaries but also by the fact that E. T. Pickard, chief of the Textile Division of the Department of Commerce, is acting as its secretary. Mr. Pickard is well qualified for this work and he should make helpful contributions to it as the outcome of his study, on the ground this summer, of operations of textile research bodies abroad.

In the last issue of the AMERICAN DYESTUFF REPORTER, that of June 9th, the hope was expressed that there might be all necessary and desirable co-operation between the Foundation and the recently established United States Institute for Textile Research toward the common goal of research for the benefit of every interest in the textile field. Certainly it is a fine thing that the Institute was organized just previous to the enactment and signing of the legislation creating the Textile Foundation. The two bodies should work in harmony to the attainment of common ends; in many ways they should be complementary. The aim of both is to foster practical research in the textile field, and the best use of available funds is essential to this result.

It can be entirely understood why, on accepting membership on the directorate of the Foundation, Messrs. Hobbs and Cramer felt that it would be unethical for them to continue on the board of directors, even a temporary board, of the United States Institute. The Foundation and the Institute, as distinct entities, must be kept distinct. Such co-operation as is possible between them will develop the more quickly and effectively through the recognition of this fact, and Mr. Hobbs and Mr. Cramer deserve credit for their instant appreciation of the niceties of the situation.

A LAW AND A HOPE

IN PRESIDENT HOOVER'S opinion the oustanding feature of the new tariff legislation is the reorganization of the flexible provisions of the law. The belief is that, through this reorganization, opportunity now is afforded for semi-judicial review of items in the law with respect to which there may be inequalities to be adjusted or mistakes to be corrected.

The President, like many of his fellow-countrymen, is quite well aware of the evils of tariff making under Congressional enactment. Congressional revisions, he says, "are not only disturbing to business but with all their necessary collateral surroundings in lobbies, log-rolling and the activities of group interests are disturbing to public confidence."

Happily, the tariff agitation of 1929-30, taking definite form in the Smoot-Hawley Bill, just passed and signed, is a thing of the past in so far as action on the bill is con-

cerned. The effects of the bill, economic and otherwise, are yet to be recorded. To study these effects, when and as they may be presented for review, is the function of the new Tariff Commission, a body vested with important powers. It will be not only a fact-finding commission—a familiar Hoover expedient—but a fact-determining commission whose recommendations will go to the Chief Executive for approval or disapproval. Also it is to be emphasized, these recommendations sooner or later will go before the nation for a verdict.

The Tariff Board can do much, if it will, to take the tariff out of politics. Any part of that herculean task well performed would go far to justify the commission's existence and its work. It should be with a sobering sense of responsibility that the commission's duties are taken up. The responsibility is to consumers as well as to producers, to labor as well as to capital, to all the people and not to this or that section of our national life.

STANDARDS OF PROGRESS

WHEN old Isaac Watts wrote in one of his familiar stanzas the line "The mind's the standard of the man" it is not to be supposed that he favored a mind that would forever stay put—an immobile mind, not susceptible of further improvement. What he doubtless, and probably most devoutly, hoped was that man's measure, as recorded mentally, would be on an ascending scale. Something of the same thought with respect to progress is evidenced in the statement prefacing the American Standards Year Book for 1930, a statement evidently intended to summarize the spirit of the American Standards Association: "Standardization is dynamic, not static. It means not to stand still, but to move forward together."

The Year Book marks the completion of the first twelve months of the activities of the Association since its reorganization at the close of 1928. As William J. Serrill, its president, points out, there has been rapid evolution since the American Engineering Standards Committee became the American Standards Association. Not only have methods been made more flexible and policies more liberal, but the administrative set-up has developed in efficiency. Joining the International Standards Association and completing a working agreement with the Bureau of Standards may be regarded as two of the most progressive steps taken during the past year.

Random Thoughts On Research

Who Shall Be Hired?

THERE is another kind of question that some one will have to settle when the time comes to begin textile research. What type of man shall be hired to conduct the work? We neglect for the moment the average employee who will actually do a large share of the work and will be selected for his fitness for a particular line or a particular problem; also, the specialist who is expected to know more than anyone alse in the place about organic synthesis, how to tame the elusive pH, or to make light rays perform unusual acrobatics.

Leaving out the classes who are hired for special purposes, what sort of men will be best to actually run the outfit, not the trustees or advisory board, etc., but the actual directors? Shall men be engaged who have made a name for themselves in some field outside of textiles? Shall men be hired who shall have the so-called detached point of view, who are supposed to see the field from an eminence (more or less imagined) and spot at once all the places where fertilizer is needed?

An expert was defined for us at the Philadelphia banquet as an ordinary man away from home, and there seems every reason to believe that there are men within the industry just about as good as there are outside. And, if we are to preach research and encourage the development of research men in the industry, it would seem not to be fair to fill the most responsible positions from outside until those within the industry who are qualified have had a fair opportunity to compete for them. Of course, they must measure up, to be successful.

It is not desirable that a scientific problem be approached with preconceived ideas and that is one reason for the detached viewpoint that is sometimes advocated. Now there are two parts to an experiment, or to a larger piece of research—the arrangement of the conditions of the experiment and the observation of the result. No one can intelligently arrange an experiment without some sort of *preconceived* idea of how it should come out. Usually it is expected to support, or fail to support, some view that can be foreseen. It seems reasonable that one who is already familiar with the particular type of work with which the problem is connected, would be likely to draft a better plan than one who is less familiar.

The making of observations cannot be entirely freed from the taint of preconceived ideas, for very frequently some such idea of the subject is required in order that one may know what to look for, and may not miss valuable data that might be useful for some other purpose than the direct object in view.

Interpreting results is perhaps a little more difficult to do with an open mind, but a true scientist will report what he sees even though it may not fit his preconceived theory. We can see the advantages of the detached and fresh point-of-view in ordinary business relations, and in executive and technical work where the incumbents of the various positions have not been particularly selected for broad-mindedness. In filling the more scientific positions for research work the selections should be made according to general soundness of viewpoint and willingness to accept new ideas at somewhere near their true value. The man who has these characteristics will do just as good work from this point of view whether or not he is widely experienced in the textile field; but if he is experienced in textiles he will have the added advantage of knowing more of what he is about when actually planning and conducting experimental work.

Elementary Textile Microscopy

Part II—Methods

Micrometry—Units—Fiber Measurements—Microchemical Reactions—General—Crystallization—Solution—Color Reactions

By **JOHN H. SKINKLE**

Department of Chemistry, Lowell Textile Institute

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(Continued from issue of June 9, 1930.)

MICROMETRY may be defined as the measurement of objects of microscopic size. Since the objects measured are so extremely small, it may be seen that, if we use ordinary units such as inches, centimeters, or even millimeters, we get cumberous fractions; to prevent this, use is made of the unit called the "micron" which is defined as one-thousandth of an millimeter or approximately one twenty-five thousandth of an inch. The micron is ordinarily expressed as the Greek letter "mu" (u). In this connection it is interesting to note that an even smaller unit is sometimes used—this is the milli-micron or one thousandth of a micron and is expressed wrongly sometimes as uu and sometimes rightly as mu.

Micrometry—Calibration of Eyepiece Micrometers

The disc micrometer has already been described (see section on micrometers). To use it, the top lens of an eyepiece is removed and the disc micrometer dropped in so that it rests on the diaphragm. The top lens is replaced and the eyepiece inserted in the microscope. If the figures, on examination are reversed, the disc must be removed and reversed before use.

With the disc micrometer correctly in place, the microscope is focused on a stage micrometer and the latter moved around (a mechanical stage is useful here) until two lines on the disc coincide with two lines on the stage micrometer, as in the accompanying illustration. The micrometer value or the value of one small division on the disc micrometer expressed in microns is calculated. When using high magnifications, the lines of the stage micrometer appear as very broad compared to the lines of the disc micrometer, and a chance of error is introduced in the location of the lines of coincidence. The two lines on the disc micrometer should coincide with the same parts of the broad lines of the stage micrometer, that is, both lines should coincide with the left edge, both with the right edge, or both with the center of the wide lines of the stage micrometer (see accompanying illustration).

The large divisions on the stage micrometer are tenths of a millimeter (usually) and the small divisions in one of the tenths are hundredths of a millimeter. Using low magnifications, the calibration may usually be carried out in the tenths section of the stage micrometer, but the calibration at high magnifications is carried out in the hundredths section.

The construction of the filar micrometer has already been discussed (section on micrometers.) To calibrate, the microscope is focused on a stage micrometer and the movable hair is brought into coincidence with one line. The position of the hair with regard to the inside scale and the reading of the outside drum is taken and the hair is then brought into coincidence with another line and other readings are taken. In using the filar micrometer, the hair line should always be moved in the same direction when taking measurements to avoid error due to play or "back-lash" in the moving parts.

Micrometry—Fiber Measurements

Measurements usually made in textile work are:

1. Diameter of yarns or filaments.
2. Voids or free space in cloth.
3. Diameter of fibers.
4. Number of scales per millimeter of various animal hairs.
5. Size of starch granules.

Where liquid mounts are desirable and water cannot be used because it might swell the object; Nujol or some similar colorless mineral oil may be used.

Where only a small sample of a yarn or cloth is available the count or denier of the yarn may be obtained by measurement of the diameter of the yarn and comparison

with the diameters of yarns or filaments of known count or denier. It should be remembered that the count varies inversely as the square of the diameter, while the denier varies directly as the square of the diameter.

The so-called "covering power" of yarns, especially the rayons, is often of value. This is obtained by examining a known area of the cloth by transmitted light and measuring the length and breadth (and consequently the area) of the voids or free spaces in the cloth. The percentage free space should be as low as possible if good "covering power" is desired.

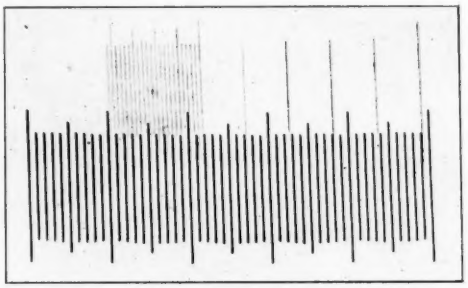


Figure 37. Calibration of a Disc Micrometer
11 disc divisions=.200 mm.
Micrometer Value=18.2 microns

The diameter of fibers is often of value in identifying the fibers. If a yarn is composed of a mixture of fibers, a quantitative estimation may be obtained by preparing cross-sections of the yarn and measuring the areas of each of the fibers; knowing the density of the fibers, the percentages by weight may be calculated. The diameter of fibers is often used to determine the uniformity of a sample; thus if fibers of the same kind but of widely different diameters are found in a sample, it is an indication of a mixture of two lots of fiber.

In identifying an animal hair, the number of scales per millimeter of length is of value. This is obtained by measuring a known number of scales and calculating the number in one millimeter. The average of several measurements should always be used.

In the identification of starches, the size, as determined by means of a micrometer, may be of considerable help. In the estimation of the amounts of components in a mixture of starches, the total areas of the components of a field may be assumed to be proportional to their weights.

It is important for the student to realize that a number of readings should always be taken and averaged in micrometry.

Microchemical Reactions—General

Microchemical reactions are ordinary chemical reactions or stainings carried out with small amounts of unknown and reagent, the course or the results of which are watched through the microscope. In most cases the reactions may be carried out on large amounts and watched with the naked eye but in some cases, a microscope is essential; moreover, large amounts of an unknown are not always available, so it is safer in all cases to treat the sample as though only a very small amount were available.

Where fibers are to be treated, a few are teased out and the reagent applied; where yarn is to be examined, about a quarter of an inch is cut off and treated; where cloth is under examination, it is picked apart and its component yarns treated separately.

Where any heating is to be done, a corner of a slide should be used, otherwise the center of the slide is easier to work on. A magnification of 100 x is usually sufficient to observe the results; the use of stronger objectives than 10 x (16 mm.) is undesirable because the small working distance would involve danger of chemical damage to the lens or its mounting. It should be remembered that some of the reagents used are extremely corrosive and volatile so the objective should always be cleaned after use even though it does not seem to have touched the solution.

The three usual types of microchemical reactions used as tests in textile work are:

1. Crystallization reactions.
2. Solution reactions.
3. Color reactions.

Microchemical Reactions—Crystallization

Practically all the metals and non-metals have typical crystalline microchemical forms, for a complete survey of which the student should consult Chamot's "Elementary Chemical Microscopy." The most important metal to the worker in textiles is calcium, which may be present on textile materials in the form of a calcium soap from hard water, as chalk from marking crayons, as calcium chloride from sizing, or as gypsum from loading.

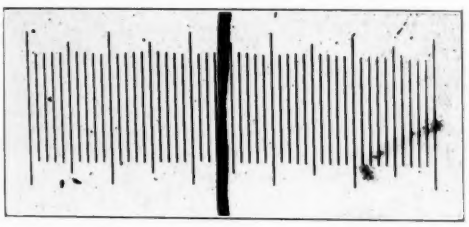


Figure 38. Measurement of Fiber Diameter
Diameter=1.1 divisions or 1.1x18.2=20 microns

To test for calcium, a portion of the material is boiled with dilute hydrochloric acid, the solution evaporated down and a drop placed on a slide. A cover glass is added, and along one edge of the cover glass is placed a drop of six normal sulfuric acid. On examining through the microscope, a number of needle-like crystals of calcium sulfate usually arranged in X's or star-like clusters may be observed if calcium was present.

Microchemical Reactions—Solution

To test for acetate rayon, a small piece of material is placed on a slide and a drop of glacial acetate acid is added. If the material is acetate rayon, it will completely dissolve. If the material is found to be acetate rayon, a piece should then be treated with 50% acetic acid. Celanese or cellulose tri-acetate will dissolve at this concentration whereas Lustron or cellulose di-acetate will not dissolve at any concentration below 65% acetic acid.

To test for animal fibers where, because the material is dyed, the color reaction (given in the next section) cannot be used, a drop of 5% potassium hydroxide is

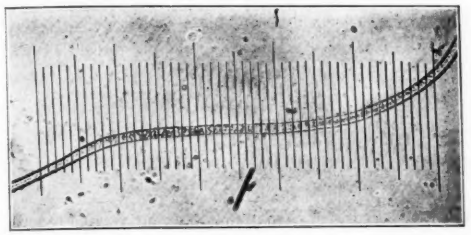


Figure 39. Determination of Number of Scales per Millimeter
6 scales=5 divisions=91 microns
Scales per Millimeter=66

added to a small piece of material and heated. If the material dissolves, the presence of animal fiber is indicated.

MICROCHEMICAL REACTIONS—COLOR REACTIONS

To test for starch: a very dilute solution of iodine is added, a blue color indicates the presence of starch. If the starch is "modified" or partly dextrinized the color will be more reddish.

To test for animal fibers, a drop of freshly prepared Millon's Reagent (see Table IV) is added to the fiber and, if necessary, heated. A brick-red color (or if the reagent is old, a yellow color) indicates an animal fiber.

To test for lignin, a drop of aniline sulfate solution (see Table IV) is added to the material. A yellow coloration indicates lignin. Other substances, such as phloroglucinol may be used instead of aniline sulfate, but the latter is perhaps the simplest to prepare and use.

To test for nitro rayon, a drop of diphenylamine reagent (see Table IV) is added to the material. If nitro rayon is present, it will be colored blue immediately, and on standing it will dissolve to give a blue solution.

To test for tannin, a drop of ferric chloride is added. A black coloration indicates the presence of tannin.

To test for oxycellulose, the material is immersed for five minutes in a one to one thousand solution of Methylene Blue and thoroughly washed by repeatedly adding a drop of water and removing it with filter paper. A blue staining indicates the presence of oxycellulose.

A solution of Congo Red is said to stain a cotton fiber, the cuticle of which has been damaged by harsh mechanical treatment.

To test for fat or oil in a fabric, a drop of an alcoholic solution of one of the Sudan dyes (preferably Sudan III) is added and then the material is washed with alcohol. If staining occurs, fat or oil is present. This test is of value on material which dyes unevenly since oil or grease is frequently the cause.

(To be continued)

Notes on the Use and Construction of Dyeing Machines

WINCH MACHINES

***By* A. J. HALL, B.Sc., F.I.C., F.T.I.**

IN THE preceding article of this series (March 31, 1930) consideration was given to the ordinary Lancashire "jigger" or "jig," and many reasons were given in support of the contention that it is the most useful of dyeing machines. Yet there are several types of textile materials which for various reasons cannot be dyed on a jig but must be processed on some form of winch machine. In recent times, owing to changes in the popularity of different types of fabrics, the use of winch dyeing machines has increased, and this has caused a certain amount of dismay among dyers who have hitherto found it possible to effect all their dyeing on jigs.

Before turning to the construction of a winch dyeing machine it is desirable to point out two fundamental differences between jig and winch dyeing. In the winch machine the fabric being dyed is (1) slack or free from warp and weft tension, (2) immersed in the dye liquor the greater part of the time, and (3) more or less in rope form. In the jig, on the other hand, the fabric is under tension whilst being pulled from one roller to the other, is out of the dye liquor almost all the time of dyeing and is maintained in open width practically free from creases. These differences have important effects on the coloring and resulting handle and appearance of the dyed fabric such that it is the construction of the fabric which largely decides in which type of machine dyeing must be carried out.

It is obvious that fabrics which readily become permanently creased must be dyed on jigs. On the other hand if the fabric depends for its final handle and appearance on a shrinkage of warp or weft during dyeing then it must be processed on a winch machine; if processed on a jig it would be subject to such tension as to prevent the shrinkage and consequent crepe effect. These points will

be considered further in relation to types of fabric after dealing with the winch dyeing machine itself.

A typical winch machine is shown in Fig. 1. It consists of a circular winch W. mounted over a deep and comparatively narrow vat V. having a small part partitioned off by a perforated plate P. so that the liquor can be heated by the steam entering through S. without blowing directly on the fabric F. Owing to the rotation of the winch the fabric F. is continuously drawn out of the dye liquor, over the freely rotating roller R., over the winch, and then it falls back into the dye liquor. A more modern type of winch machine is shown in Fig. 2 the essential differences being that the winch is oval and the vat considerably wider. In this second machine the oval winch plaits the fabric along the bottom of the vat and thus assists the better distribution of fabric within the dye liquor.

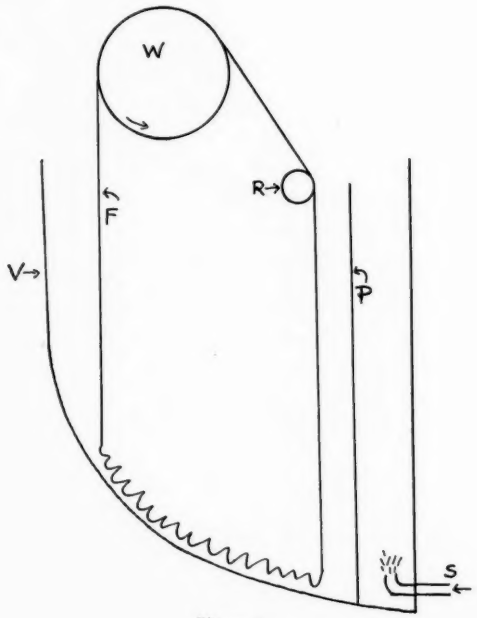


Figure 1

In a winch machine the fabric being dyed soon assumes the rope form unless hand labor is provided to open it out continuously—not an easy task if the dye liquor is maintained at boiling temperature. It is thus possible, by inserting suitably spaced guiding pins, to dye more than one piece of fabric at the same time; six pieces are frequently dyed simultaneously, but not more.

In the past, winch machines have been constructed mainly of wood but recently these have been largely displaced by wood machines lined with Monel metal or vulcanized rubber or made practically entirely of stainless steel or some other similar metal; probably stainless steel is most in favor.

It is also desirable that the rods or lathes of the winch should be readily replaceable or preferably made of a stainless metal. The use of stainless materials has largely come about because of the smaller quantities of fabric which are now dyed to a shade (big runs of one shade are now less common than formerly) and also because of the increased quantity of cellulose acetate silk which is being processed. It is exceedingly difficult to destroy, or remove by washing, the cellulose acetate dyes when absorbed in wood. In subsequent dyeings these absorbed dyes diffuse out of the wood and tint any cellulose acetate silk present.

A useful device which should be fitted to every winch machine is the automatic "knock-off." It sometimes happens that the endless lengths of fabric being dyed become entangled so that they cannot pass over the winch. Under these circumstances either the fabric breaks or it slips on the winch and thus becomes damaged. The automatic knock-off is a rail across the vat and over which the fabrics pass; if any fabric becomes tight then the rail lifts and puts the winch out of gear. Much damage can be avoided by this simple but useful device.

So far, only those winch machines have been considered in which the winch is fixed in relation to the vat underneath. Most winch machines are built in this manner. Disadvantages are associated with this type of machine. Thus when a piece of the fabric is cut out and dried for the purpose of allowing the dyer to estimate whether or not the fabric is dyed to the pattern of shade it is almost inevitable that the fabric remaining in the vat continues to absorb color and so the shade changes slightly. Also, in the case of the deeper type of vat the fabric is liable to become tightly packed. These disadvantages can be overcome by use of a modified type of machine such as is described below.

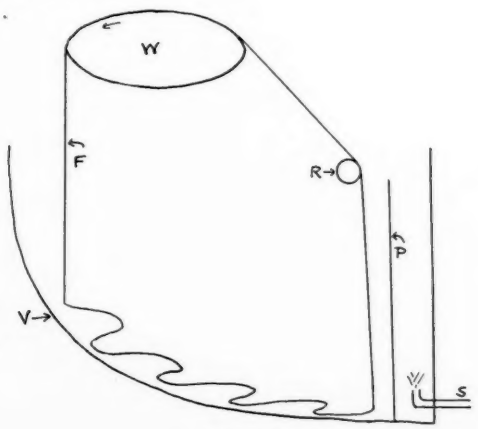


Figure 2

The machine is shown in Fig. 3 and consists of a long rectangular vat divided into a small (B) and a large (A) compartment. The winch is mounted over the vat and can be moved along the length of the vat. In commencing to dye it is usual to have the winch near to the remote end of compartment A and then from time to time the winch is moved in steps towards compartment B; in this manner the fabric being dyed is well spread out in the dye liquor and can thus be dyed uniformly. If for any reason such as taking out a piece of fabric for matching purposes it is desired to arrest dyeing the fabric is simply passed over the winch into the small compartment

which merely contains cold water. Later, as desired, the fabric can be passed again over the winch into compartment A and dyeing continued. Experience shows that the extra compartment B can be very useful and is well worth the extra cost and the space it occupies.

In considering the types of textile materials most suitable for dyeing in winch machines it may be at once stated that the possible output from a winch machine is considerably less than that from a jig; the jig will therefore be preferred whenever its use is allowable.

The winch machine is almost the only one which is satisfactory for knitted goods, particularly for tubular fabric made of rayon; these cannot be dyed on a jig. The winch machine is quite unsuitable for plain 100 per cent cellulose acetate rayon woven fabric; the creases which form in it and which cannot be avoided cannot be removed and thus contribute to spoil the appearance of the fabric. 100 per cent viscose silk rayon woven fabric can be dyed but there is no advantage over dyeing on the jig.

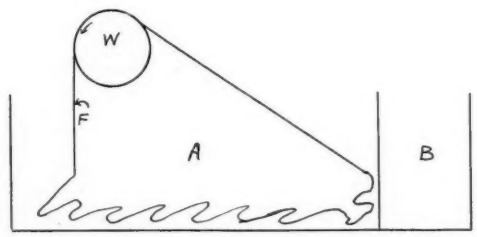


Figure 3

Lately 100 per cent spun viscose rayon fabrics have become increasingly popular since, when correctly processed, they have a soft warm wool-like handle. These characteristics cannot be obtained by dyeing on a jig because the tension involved prevents the warp shrinkage which is necessary to give the correct handle; the winch machine is very suitable for such materials. The only difficulty in this case about the use of the winch machine is that unless the temperature of the dye liquor is raised quite gradually shrinkage (due to the presence of crepe yarns) occurs too quickly and the creases in the fabric renders this shrinkage uneven along the creased portions. It is in this manner that the so-called "crimps" or "crows-feet" are produced and it is exceedingly difficult to remove them. Nevertheless, if proper precautions are taken then such defects do not occur.

In general it will be seen that the winch machine is suitable for knitted fabrics, and for fabrics which must shrink in their processing for the production of crepe or wool-like handle. It is not a machine which is suitable for woven fabrics which readily became permanently creased. Finally its production is somewhat low and therefore will only be used where the jig is unsuitable.

Thirty-Second Commencement at Lowell Textile Institute

An address by Edward E. Whiting, former Boston newspaper columnist and fellow of the Engineering Economics Foundation, the usual announcement of the winners of scholarships together with the conferring of diplomas and degrees featured the annual commencement exercises of the Lowell Textile Institute.

The men who received degrees or diplomas are as follows:

Department of Chemistry and Textile Coloring—*Morris Arnold Barsky, William Alvah Colby, Jr., *Arthur Francis Gallagher, George John Greendonner, Jr., Herman Peter Gross, *Bliss Morris Jones, *Samuel Irving Kolsky, Henry Konieczny, *Gerald Francis McDonald, Francis Patrick McGee, Earle Raymond McLean, Lloyd Sanford Ray, Alfred Charles Stacey, John Weeden Stewart, Leon Topjian.

Department of Textile Engineering—Earl Royal Beeman, *Richard Sumner Cleveland, Kirke Harold Dunlap, Jr., Harmon Howorth, Emanuel Arthur Kostopoulus, Marharaj Krishan, Harold Lawrence Preston, Walter Archibald Robbins, Edward William Tamulonis.

Department of Cotton Manufacturers—Hsiung-Yuan Tang.

Department of Wool Manufacture—Allen Frank Garner, Thomas Sheridan Sadler.

Department of Textile Design—Joseph Raddin Carleton.

(Men with * beside name are members of Tau Epsilon Sigma, scholastic honor society.)

The scholarships were awarded as follows:

Medal of the National Association of Cotton Manufacturers presented by Irving Southworth to Richard Summer Cleveland; Textile Colorist Award, a prize of $100, to a member of the graduating class whose thesis based upon his personal researches and experience is of the greatest practical value to the dyeing, bleaching or textile finishing industries, to Morris Arnold Barsky; Louis A. Olney Book Prize (in the form of books), $20 to a regular student in the chemistry and textile coloring course who shall present the best thesis preparatory to

Front Row (left to right)—Leon Topjian, Morris A. Barsky, Bliss M. Jones, Samuel I. Kolsky, Henry Konieczny

Rear Row—George J. Greendonner, Earle R. McLean, Willard A. Colby, Alfred C. Stacey, Gerald F. McDonald, Arthur F. Gallagher, Francis P. McGee

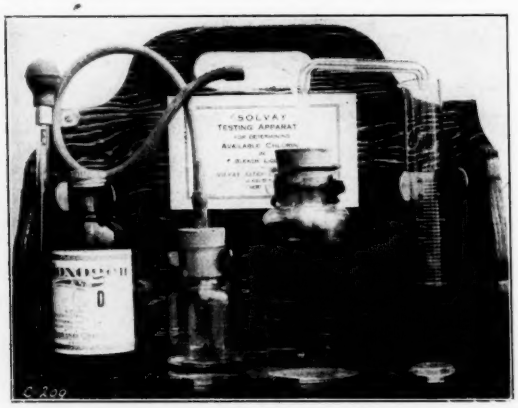
graduation, to Samuel Irving Kolsky and Bliss Morris Jones for a joint thesis with honorable mention being given to Earle Raymond McLean; Louis A. Olney Book Prizes, $10 and $5 respectively to the students taking the regular chemistry and textile coloring course who shall be considered as having attained the highest and next to highest scholarship in second and first year chemistry, *Second Year,* first prize to Stanley Squire Hockridge, second prize, Joseph James Pizzuto, Jr., honorable mention, Lorne Fernley Howard and Herbert Eugene Meinelt. *First Year,* first prize to Henry Alfred Wells, Jr., second prize, Raymond Lewis Matthews, honorable mention, Gerald Adelbert Robillard, David Henry Turcotte.

A Handy Device for Testing Hypochlorite Bleach Liquors

By R. H. SAWENS
The Laboratory of The Solvay Process Co., Syracuse, N. Y.

USE of hypochlorites is almost synonymous with present-day bleaching practice in the cotton and linen industries. No other bleaching agent which combines economy with equal effectiveness has yet been developed.

A few mills adhere to the old practice of merely stirring up some chloride of lime in water and allowing the insoluble sludge to settle to the bottom of the container. The clear or semi-clear liquor is known as "hard" bleach, no doubt due to the presence of dissolved lime salts which are comparable in a way to the presence of lime salts in "hard" water. The more common modern method involves the passing of gaseous or liquid chlorine into a solution of alkali, the resultant product being sodium hypochlorite or "soft bleach." In this type of bleach there is no insoluble sludge to settle out. It is said to produce a softer textile finish than does the chloride of lime bleach. Sodium hypochlorites may also be prepared either by passing a suitable electric current through a solution of ordinary salt, or by treatment of a chloride of lime solution with an alkali or soda product. In the textile industry the last-named methods are not common.



Whatever the scheme of producing the hypochlorite the active constituent is known as "available chlorine." The word "chlorine" is modified by the word "available" because in practically all hypochlorite solutions there is chlorine present in combinations which have no bleaching action—for example, ordinary sodium chloride. It should be remembered also that the available chlorine itself has no bleaching power, but merely serves as a measure of the amount of oxygen which may be liberated from the hypochlorite. It is oxygen which does the bleaching.

Hypochlorites normally are inoffensive and valuable aids to the production of white fabrics, but like most other good things, when their use is abused the results are likely to be disappointing or even disastrous. It is for this reason that the careful bleacher makes sure of the strength of his bleach before he uses it; if the bleach is too weak it will not produce a satisfactory white; if it is too strong the strength of the fabric is likely to suffer.

Realizing that many mills are not equipped with laboratories for the routine testing of materials such as bleach liquors, chemists connected with the laboratories of the Solvay Process Co. set about the development of a simple method for making these tests, which could be easily learned and used by anybody. The result is a very neat little device which utilizes the principle that hydrogen peroxide is decomposed by hypochlorites, giving off oxygen gas. The amount of oxygen liberated is in exact proportion to the quantity of available chlorine present in the hypochlorits bleach. The only chemical required is household peroxide.

The apparatus is so designed that the liberated oxygen displaces an equal quantity of water, and the percentage strength of the bleach is found by merely noting the quantity of water in a graduated cylinder. Only a minute or two is required to make the test.

The bleach testing outfit is fitted into a well-finished rack, and comes complete with instruction card and a convenient carrying case. As a service to the textile industry these outfits are furnished by the maker at cost. Anyone who is interested may obtain further details from Solvay representatives, or from the main office of Solvay Sales Corporation at 40 Rector Street, New York City.

Changes in Directorate of U. S. Institute for Textile Research

Following their appointment by President Hoover as directors of the Textile Foundation, formed in accordance with the Merritt Bill, Franklin W. Hobbs and Stuart W. Cramer tendered their resignations as members of the preliminary board of directors of the United States Institute for Textile Research.

Also since the recent meeting in New York City, two additional members of the Institute board have been appointed; E. L. Clements by the Associated Knit Underwear Manufacturers of America, and E. I. Starr by the Durene Association of America.

The next meeting of the Institute will be held in New York City just as soon as the committee on by-laws is ready to report. This group is composed of Dr. Elvin H. Kilheffer, president of the American Association of Textile Chemists and Colorists, P. J. Wood, acting chairman of the Institute, and C. H. Clark, acting secretary.

Technical Notes from Foreign Sources

Dyeing of Acetate Silk

H. Brandenburger—Kunst-Siede 12, 51 (1930).—The paper deals with the question of luster and color; it is principally devoted to a discussion of these topics in reference to the use of the step-photometer. It does not lend itself to abbreviation.

Steaming of Dyed Goods

Mario Gherardi—Boll. della Assoc. Ital. Chim.-Tess.-Col. 5,447 (1929).—A short, illustrated, condensed discussion of the subject titled.

Treatment of Weaves Containing Acetate-Silk, for Dyeing with Substantive Colors

G. Tagliani—Boll. della Assoc. Ital. Chem.-Tess.-Col. 5,255 (1929).—An interesting paper, with little news, but well discussed.

Dyeing of Wool and Silk

French Pat. No. 643,307; *L. B. Holliday and Co. and C. Shaw*—The material is dyed with 2-5 dichlor or 2-5 dibrom 1-4 benzoquinone from an acid bath. The dyeings are brownish-red, and are very fast if after-chromed. Instead of using bichromate, copper sulphate or iron sulphate may be used for the after-treatment.

Wetting-out Agents

Swiss Patent No. 130,640; *Sandoz, Basle*—Consists merely of a mixture of a phenol with a hydrogenated naphthalene, for example, a mixture of 92 parts of crude cresole and 8 parts of tetrahydronaphthalene.

Wetting-out Agents

British Patent No. 291,070; *H. T. Bochme A.-G.*—A mixture of heterocyclic bases, as pyridine, quinoline, etc., and the familiar sulphonic acids of alkylated naphthalenes, e. e., mono or dibutyl-naphthalene sulphonic acids or homologous products from di-isopropyl-naphthalene, is proposed. The same patent appears as French Patent No. 654,624, of the same firm.

Aniline Black, Non-Tendering

British Patent No. 294,554; *Dr. Karl Schmidt*—The modification of the usual procedure consists in the addition, to the bath of aniline salt, oxidizing agent, and catalytic agent, the salts of easily oxidizable acids possessing a protective action. For each 5 parts of aniline salt, 2 parts of such a protective salt, as the salts of sulphurous or phosphorous acids, or a thiocyanate, are employed.

Alteration of Dyeing Properties of Cotton or Viscose

French Patent No. 648,026; *Sandoz, Basle*—The material is treated with the chloride of an aliphtaic or aromatic sulphonic acid, as benzene-sulphonic chloride, and a tertiary base, such as pyridine, quinoline, etc. The modified fiber can then be satisfactorily dyed with acid wool dyestuffs.

Dyestuffs for Acetate-Silk

British Patent No. 284,652; *I. G. Farben-Ind. A.-G.*—The dyestuffs proposed are formed by coupling a suitable diazotized amine to a second component, which contains a benzene ring condensed with a five-membered heterocyclic ring, the second component, of course, containing at least one point to which coupling can take place. Such components are, e. g., beta-cumaronone, oxindoles, oxythionaphthenes, etc. The dyestuffs should not contain more than one sulphonic or carboxyl group. The products yield clear, greenish-yellow dyeings upon acetate-silk.

Flow in Liquids of High Viscosity

O. Schrenk—Kunst-Seide 12,7 *and* 47 (1920)—A paper on the mechanics of flow in viscous liquids, with special reference to practical problems encountered in the spinning of artificial silk. Of a decidedly mathematical-physical nature.

Cellulose—Its Structure and Technical Utilization

H. Mark—Mell. Textil-Ber. 10,695 (1929).—A paper from the purely scientific side, dealing with the most recent hypothesis and assumptions regarding the internal structure of cellulose, and supported by five diagrams of the supposed physical makeup of the molecule, with reproductions of three Roentgenographs. The theories are well constructed, but it is hard to believe that a good deal of faith has not been exercised in accepting the dicta of the different investigators whose interpretations of their own work have been accepted.

Studies in the Mordanting and Dyeing Processes

E. Eloed and E. Silva—Mell. Textil-Ber. 10,707 (1929).—A likewise purely scientific study, dealing with the theory of dyeing of animal fibers (wool was the one particularly investigated) with acid dyestuffs. The well-known physico-chemical views so largely prevailing at the present time are of course adhered to.

Colloid Chemistry and Dyeing

Dr. K. Schultze—Seide 34, *pp.* 169, 209, 247 (1929).—A series of papers well and clearly written, a thesis, so to speak, constructed for the preconceived viewpoint that the processes of dyeing are probably nearly always of colloidal nature.

Solvents and Swelling-Agents for Acetyl-Silk

Dr. August Noll—Seide 33,404 (1928).—A very valuable article of seven pages, full of detailed information regarding the substances coming under the above title. The last page is a spaced tabular view of the substances most used for such purposes. It is one of those too

rare, refreshing papers which are packed full of definite information, hypothesis or theory being scarcely if at all mentioned.

1930 Fall and Winter Colors

The 1930 Fall Season Card portraying eighty new shades has just been released to members, according to an announcement made recently by the Textile Color Card Association.

Browns in three ranges are significant among the new colors. These include rose browns, rich mahogany tones and a gamme with a slightly yellowish cast. Considerable importance is accorded reds for the coming Fall season, especially in a group of four hues shading from a rich rose red to a deep wine tone. Greens, which are expected to repeat their popularity, are represented in two gammes with a bluish cast, and in a clear green range with a slightly yellowish undertone.

Three families of blues are portrayed on the card, including a new range with a royal cast, shading into an animated blue, almost navy. Greyed blues appear in four tones, and there is a range of three violet blues. Among the novelty colors having special style significance are the rosy copper hues. Other shades on the card are represented in ranges of taupe grey, golden beige and bluish purple.

Especially highlighted for evening wear and blouses, is a group of twenty-two tones featured under the caption of "Directoire Colors." These shades range from delicate nuances, which may aptly be termed tinted whites, through soft pastel tones, to brighter vivacious hues for evening wear. Basic shades chosen for Fall promotion by the Color Coordination Committee of the National Retail Dry Goods Association appear on this card, as well as colors chosen by the Associated Dress Industries of America, the Allied Millinery Associations and the National Knitted Outerwear Association.

The new colors listed in the order of their appearance on the card are as follows:

Roseheart, Mountain Berry, Jacqueminot Red, Winetone, Shadow Grey, Chantilly Grey, Taupe Grey, China Green, Buddha Green, Montreux Green, Glade Green, Clochette Blue, Bleu Glacé, Cluny Blue, Gypsy Green, Gem Green, Magnolia Green, Cricket Green, Bluish Beige, Oak Rose, Rosebrown, Bison Brown, Spanish Rust, Alcantara, España, Japanese Red, Firenze Red, Calaban Red, Rubytone, Drapeau Blue, Bluglory, Corsaire Blue, Guardsman Blue, Acajou Brown, Salvador Brown, Colonial Brown, Lake Green, Como Green, Swiss Green, Marble Green, Roserust, Copper Laque, Thorn Apple, Copperglo, Bisque Beige, Beige Ambré, Mordoré, Aloha, Hawaiian Brown, Philippine, Manila Brown, Arosa Blue, Kyoto Blue, Fresco Blue, Winterblu, Persian Violet, Japanese Purple, Oriental Purple.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED

Dyestuff Salesman with many years of Sales and Laboratory experience is desirous of a suitable position with Manufacturing concern. Advertiser has an extensive personal connection in various States and can give first-class references. Reply to Classified Box No. 608, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Graduate of Industrial Engineering Course. 14 years' laboratory, demonstrating and practical experience in dyeing and printing textiles. Desires demonstrating, sales or mill position. Address Classified Box No. 613, American Dyestuff Reporter, 440 Fourth Avenue, New York, N. Y.

POSITION WANTED

As Boss Dyer on silk hosiery, F. F. or seamless. Capable of large production, good matching. First class reference. Location no object. Address Classified Box No. 614, American Dyestuff Reporter, 440 Fourth Avenue, New York, N. Y.

POSITION WANTED

Textile Chemist with nine years' experience in all departments of bleachery and print works seeks position with finishing plant or dyestuff manufacturer. Familiar with the application of all types of dyes and finishes on cotton and rayon piece goods. Address Classified Box No. 615, American Dyestuff Reporter, 440 Fourth Avenue, New York, N. Y.

MASTER DYER

Eastern finishing plant handling cotton, rayon and silk piece goods has an opening for good man with thorough experience in vat dyeing and dyeing for discharge printing. No others considered. Technical training helpful. Application must state age, experience, and salary desired. Address Classified Box No. 616, American Dyestuff Reporter, 440 Fourth Avenue, New York, N. Y.

FOLDING ROOM FOREMAN

Textile piece goods finishing plant near New York has opening for capable inspection and folding room foreman. Thorough cotton and rayon experience essential. Apply in writing, stating age, training and salary desired. Address Classified Box No. 617, American Dyestuff Reporter, 440 Fourth Avenue, New York, N. Y.